INVESTIGATING THE DETERMINANTS AND OUTCOMES OF LEISURE TIME PHYSICAL ACTIVITY PARTICIPATION IN UNIVERSITY STUDENTS WITH PHYSICAL DISABILITIES

BY

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DISSERTATION

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ABSTRACT

This dissertation explores students with physical disabilities' (SWD) perceptions, influences, and participation levels in leisure time physical activity (LTPA) through multiple aims. First, research was conducted at the lead researcher's current university, recognized for its accessibility and programming for university students with physical disabilities (SWD). At this university, researchers aimed to understand how SWD perceive physical activity and what influences them to participate in physical activity on their university campus. Results of this research showed participants placed low value in physical activity for health, believed physical activity was not something they were able to identify with or capable of, and often lacked regularity in utilizing assistive health services provided by the university (*Chapter 3*). Based on this information and focus group input, researchers designed an inclusive aquatic exercise course to examine SWD experiences and outcomes of participation in a university offered LTPA. The mixed methods results revealed that participants had many positive experiences and beneficial outcomes of participation. Most importantly, participants' initial perceptions of the course and future recommendations for adapted physical activities can greatly assist in the design and development of campus adapted recreation (*Chapter 4*).

Next, to expand this research and address the population of SWD nationwide, a multisite, survey-based study was performed. Current and recently graduated SWD completed online, mixed-methods surveys to answer the following: what are the rates of participation amongst SWD in LTPA on their university campus compared to general population students published in previous literature, what are the external environmental and personal internal factors that influence SWD LTPA participation, and which of these factors significantly predict LTPA participation as facilitators or barriers. Results of this study indicated that participants had

similar, yet slightly higher LTPA levels than previous expected. However, these LTPA were still considerably lower than their able-bodied peers and reflective of persons with disabilities (PWD) in the adult population. Further analysis indicated numerous significant variables relating to LTPA, the strongest being participant self-regulation, exercise self-efficacy, perceived opportunities for LTPA, and QOL (*Chapter 5*).

DEDICATION

I dedicate this work to my late Grandmother, Charmaine Dysterheft. My grandmother told my father, who then taught me, to be a sponge and absorb every bit of knowledge possible. It was through her and my father that I learned to never stop asking questions and gaining knowledge. The memory of her genuine kindness and her selflessness in helping others through education has always been an inspiration.

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TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION

1.1 Overview of Literature

Transitioning into college is a critical step in the lives of many young adults, having influence on the habits and lifestyle choices they carry throughout adulthood [1]. Research has extensively studied student retention in hopes to increase college graduation rates. It has been found that students who complete their first year of college and return for the following year are more likely to continue their education to graduation [2]. Additionally, a significant influence on a student's adherence to a program or college is their social life and participation in the campus community, namely through recreational leisure time physical activity (LTPA) [3-6]. Using this information, universities aim to retain as many students to their university programs as possible, offering state of the art recreation facilities, activities, and programs to draw in students. Through these methods, university recreation programs have been very successful, with 70-88% of full-time and part-time able-bodied students participating in recreational activities on campus [7-10]. However, the literature neglects to indicate the number of students with physical disabilities (SWD) who participate in recreational LTPA on their campus, a group that makes up over 6% of the undergraduate population [11,12]. This gap in knowledge is worrisome, as SWD participation levels in LTPA may mirror the rates of physical activity observed in the general population of persons with disabilities (PWD) [13-16]. Specifically, the literature supports that despite the ample benefits of physical activity in PWD, levels of physical inactivity in this population remain extremely high [12]. The consequences of inactivity in PWD are reportedly profound and often lead to a host of physical and psychosocial health complications [17-28].

As the population of college SWD continues to grow, so does the need for researchers and universities to effectively design and promote adaptive recreational programs. These programs can support the development of healthy behavioral habits for SWD during these

critical years. It is anticipated SWD derive similar benefits to those reported in able-bodied students, where healthy behaviors established during college persist and lend to improve physiological and psychosocial functioning into adulthood [11,29,30]. Because PWD are already at a higher risk of exhibiting sedentary lifestyle behaviors compared to their able-bodied peers, the need to more effectively utilize available college resources becomes imperative. Although the benefits of physical activity in PWD are well known, there remains a dearth of knowledge on SWD LTPA levels and the outcomes they gain from participation. As of now, only one known study has examined the number of SWD who use their university recreation facility [26]. Additionally a small number of studies have qualitatively examined SWD perceptions of LTPA and socialization, however the depth and application of this data is limited [11]. No known studies have examined the facilitators and barriers SWD have to LTPA that are specific to the university setting.

Developing research on SWD is imperative because as universities become more accessible to disability, it is postulated that SWD are not confronted with the same barriers to LTPA as PWD. For example, PWD commonly report a lack of transportation and facility availability as major environmental barriers to LTPA participation [31]. Although most universities offer accessible, on-campus transportation systems and accessible recreation facilities to all students, SWD LTPA participation levels remain low. Yoh and colleagues reported over 70% of SWD used their campus recreation facility less than five times a semester [32]. These alarmingly low levels of LTPA suggest the presence of additional factors influencing LTPA participation in SWD, which may also be indicative of underlying influences in PWD.

The lack of LTPA in SWD is worrisome, given the well-known physical benefits of LTPA, as well as the critical, long-term benefits students gain through LTPA, such as academic

retention, social inclusion, and developing health practices [1,5,30,33,34]. Therefore, it is essential to better understand the extent to which SWD encounter unique facilitators and barriers to LTPA participation. Additionally, understanding the perceptions and experiences of SWD in LTPA is imperative in order to make effective programming designs and developments that have a lasting impact both at the postsecondary education level and later in life [35,36]. By gaining this information proposed in this study, universities can work towards optimizing the college experience and overall health of SWD.

1.2 Specific Aims

This dissertation explores SWDs' perceptions, influences, and participation levels in LTPA through multiple aims. To first develop a foundational understanding, research was conducted at the lead researcher's current university, recognized for its accessibility and programming for SWD. At this university, we investigated the following aims: (1) understand how SWD perceive physical activity and what influences them to participate in physical activity on their university campus, (2) design a new, adapted recreational physical activity course and investigate SWD experiences, as well as psychosocial outcomes of participation. These experiences and outcomes were used to determine whether SWD obtain similar benefits to LTPA as their peers without disabilities. Additionally, information on SWD experiences was used to make recommendations for future design of adapted recreational programming.

Finally, we wanted to expand the initial research and address the population of SWD nationwide. To accomplish this, we recruited current and recently graduated SWD from multiple U.S. universities. An online survey was used to investigate the following aims: (3a) determine rates of participation amongst SWD in LTPA, (3b) examine the influence of external-environmental factors on SWD LTPA participation (3c) test the influence of internal-personal

factors on SWD LTPA participation, and (3d) determine which of the aforementioned factors in aims (3b) & (3c) predict participation in LTPA as facilitators or barriers.

1.2.1 Specific Aims

1. Chapter 3. Understand how SWD perceive physical activity and what influences them to participate in physical activity on their university campus. Using a mixed-methods approach, we surveyed and interviewed SWD to answer two primary research questions: 1) What are SWDs' personal perceptions and knowledge of physical activity, and 2) What are SWD's primary influences to participation in physical activity? These data were aimed to explicate what internal and external factors drive physical activity participation in SWD. Data from this study was used to help shape the intervention design for Aim 2.

   Hypotheses

   1a. Participants definitions and perceptions of PA would be dependent on their physical abilities, past experience with physical activity, and health, as well as the university environment

   1b. Participants would exhibit different influences to PA when compared to ABS and PWD [31,37-41].

   1c. Participants would be more heavily influenced by the presence or absence of disability support services provided by the university

2. Chapter 4. Examine the experiences and proposed benefits of an adapted LTPA course. Using information obtained in aim 1 and focus groups, we designed an adapted aquatic exercise course at the researchers' university. The course allowed SWD to participate in aquatic exercise in a group setting, with the assistance of trained able-bodied peers. Pre- and post-intervention surveys were conducted to examine changes in LTPA levels, perceived

quality of life (QOL), exercise self-efficacy, and social inclusion. Interviews were also conducted following the intervention to provide more rich data on student experiences and outcomes of the course. Survey outcomes of participants in the course were compared to a control group that remained physically inactive during the 5 week testing period.

Hypotheses

2a. Participants in the aquatic exercise class will demonstrate positive improvements in perceived QOL, exercise self-efficacy, and social inclusion, demonstrated by the survey measures. These improvements will be supported by the qualitative data collected during the interviews.

2b. The control group will show no significant changes in perceived QOL, exercise self-efficacy, and social inclusion, demonstrated through the survey measures.

Chapter 5. Examine SWD LTPA participation levels, influences, and perceptions of physical activity in campus recreation programs at multiple universities. Information about online surveys were distributed to participating universities and through social media to SWD. Qualifying participants were given links to complete multiple choice and short-answer surveys on their current physical activity levels, perceived QOL, exercise self-efficacy, exercise self-regulation, social inclusion, and barriers to physical activity. These surveys were used to address the following research questions: (a) what are the participation levels of SWD in LTPA on their campus compared to the LTPA levels of able-bodied students, as published in previous literature, (b) what external environmental factors, i.e. available recreation facilities, accessible equipment, or programing, influence SWD LTPA participation, (c) what internal personal factors, i.e. self-efficacy, self-regulation, and social support, influence SWD participation in LTPA, and (d)

which of the external environmental and internal personal factors reported in aims (b) and (c) predict SWD participation in LTPA as facilitators or barriers.

Hypotheses

3a. A majority of participants would use their campus recreation centers less than 5 times each semester and reflect the LTPA participation levels of PWD, as reported in previous literature [7-10,12,14].

3b. SWD will report similar external environmental influences to those reported by PWD [31], however, will report less, or more unique, external-environmental barriers due to university provision of facilities, transportation, and services.

3c. SWD will report similar internal personal influences to those reported by able-bodied peers [40]; however, health and disability will play a significant role in SWD internal personal influences to LTPA participation [42].

1.3 Research Needs

The rationale for conducting this study is both practical and theoretical. There is little empirical literature available on the current LTPA levels of college SWD. The ample benefits of LTPA for able-bodied students are well known, including increases in academic performance, adherence to the university, social integration, and the development of healthy lifestyle habits [3-6]. However, these benefits have yet to be rigorously examined for SWD, a growing part of the student population at postsecondary programs [5]. What is particularly worrisome is the literature has observed that the physical activity levels of SWD are known to severely decrease following high school and into adulthood [43]. The lack of physical activity in PWD often results in a vast number of physical, psychological, and social secondary conditions. This research can help to identify the current LTPA activity levels of SWD, their motivations for LTPA participation, as

well as influences to their participation. With this knowledge, universities can more effectively design and improve recreational programs for SWD to increase LTPA participation, optimizing of their college experience. It is necessary to develop a thorough knowledge of the current participation levels, influences, and experiences of SWD in LTPA so that successful and lasting recreational programs can be developed.

CHAPTER 2: REVIEW OF LITERATURE

2.1 Introduction

This chapter provides a review of the literature, including theoretical and contextual factors. The review will consist of an overview of the existing literature on the, physical activity and benefits of LTPA participation for persons with physical disabilities (PWD), the students with physical disabilities (SWD) population, models of disability, behavior, and benefits from LTPA participation in university students, and outcomes of LTPA in university students and known participation levels.

Multiple models and theories were used to inform the design of the present research study. Living with a disability is both complex and unique for each individual, as numerous factors interact to influence their experiences within their environment, disability, and society. To address these multifaceted interactions that influence a PWD experiences, the World Health Organization's (WHO) International Classification of Functioning, Disability, and Health (ICF) model [44,45] was used. Based on the ICF model's emphasis on the interaction between individual's environment, health, and personal self, our intervention design, data collection, and data analysis focused on examining the relationship between these three factors (Chapter 4 and 5). Specifically, the study design in Chapter 4 focused on providing a facilitative LTPA environment and individualized exercise plans to address each SWD personal needs. With the provision of these two components, we aimed to examine their relationship with the personal experiences and outcomes of SWD. Similarly, the surveys in Chapter 5 were designed to examine and measure variables from participants' environments, personal-self, and health.

Because LTPA participation is examined as a behavior, highly influenced by social and personal factors, the Social Cognitive Theory (SCT) has provided a basis for understanding the psychosocial influences to and outcomes of SWD LTPA participation [46]. The SCT was used to determine which primary social and personal factors were measured with the survey tools (Chapters 3, 4, and 5) [46]. Specifically, the factors of exercise self-efficacy (SE), self-regulation (SR), perceived quality of life (QOL), and social support have been observed to be significant determinants of LTPA participation in the general population of PWD [47-49], therefore these factors were emphasized in data collection (Chapters 3-5).

Finally, the overall importance of university student involvement and participation in LTPA is outlined by Tinto's Model of Retention [6,7] and Astin's Theory of Involvement [33]. These concepts, as well as their supporting literature, emphasize the impact of this dissertation. The proposed benefits university students gain from campus and recreational activity involvement, as outlined in previous literature, were used to determine outcome measures for Chapter 4. Because there are many benefits of LTPA participation at the university level, future research recommendations have also been made.

2.2 Physical Activity in PWD

2.2.1 Recommendations and Current Activity Levels

Physical activity is defined as any bodily movement, produced by skeletal muscle, which results in energy expenditure [50]. Physical activity is broken down into multiple categories, the most common being leisure time [50]. LTPA is described as activities performed at the will of an individual, which are not required as essential activities of daily living or work [51]. LTPA is further divided into subcategories of sports, conditioning, household tasks, and other. Many of

the activities included in these subcategories, while considered LTPA, also can be considered as exercise. Exercise, often used interchangeably with physical activity, is a subcategory of physical activity. Exercise is defined as planned, structured, and repetitive, with the purpose of maintaining levels of physical fitness [50]. With the primary goal of energy expenditure, it is currently recommended that adults, ages 18-64, should accumulate a minimum of 150 minutes of moderate- to vigorous-intensity aerobic physical activity per week, in durations lasting 10 minutes or more [15,16,52]. Additionally, it is suggested that adults participate muscle in strengthening activities a minimum of two days each week [15,16,52]. These recommendations are structured around the mounting evidence that there is a dose-response relationship between increases in physical activity levels and decreases in risk of mortality, cardiovascular disease, coronary heart disease, and metabolic disease [51]. Although these guidelines are aimed at individuals without disabilities, they are considered appropriate and recommended for PWD [15,16].

It is emphasized in the Healthy People 2020 report that PWD have alarmingly higher rates of physical inactivity in comparison to those without [14]. Reports indicate that only 27% of PWD meet the recommendations for aerobic physical activity and a mere 15% participate in muscle strengthening activities at least two days each week [13,14]. In general, almost 50% of PWD do not engage in any LTPA, nearly doubling the number of individuals without activity limitations [14]. As outlined by the Healthy People 2020 report, individuals were reported as participating in no LTPA participation if they reported never or being unable to perform light or moderate physical activity for a minimum of 10 minutes [14]. Individuals who do not meet the physical activity guidelines are considered 'physically inactive' [16,53]. Individuals who are physically inactive are at highest risk for excessive sedentary behavior, or behaviors that elicit an energy expenditure of less than 1.5 METs, while in a sitting or reclining posture [53,54].

2.2.2 Consequences of Physical Inactivity in PWD

PWD are often more likely to be physically inactive with high levels of sedentary behavior due to, in part, their mobility limitations [14,55,56]. As a result, PWDs' risk of chronic diseases such as cardiovascular disease, coronary heart disease, and type II diabetes are over four times higher than their non-disabled counterparts [57-62]. Unfortunately, for many PWD, high levels of physical inactivity also results in severe physical deconditioning. Deconditioning occurs as a disuse-induced adaption of the muscle and bone tissue, leading to physical decline and disease risk [63,64]. For PWD, this physical decline may include the escalating of medical complications, further limiting of functional capacity and mobility, as well as the accelerated progression of disease or other symptoms [17,65-68]. Physically inactive PWD are also at a heightened risk for secondary conditions including overuse injuries and pain of the upper limbs, pressure sores, fatigue, muscle atrophy, spasticity, infections, and decreased aerobic capacity [17,21,61,67-69]. Alarmingly, secondary psychosocial symptoms include increased risk of anxiety, depression, decreased quality of life, poor activity tolerance, and decreased independence [26,70-73]. IWD who are physically inactive are also at a heightened risk of feelings of social isolation, lack of acceptance by peers, and negative self-perceptions [30,74-77].

2.2.3 Physical Benefits of Physical Activity in PWD

There is an abundance of literature demonstrating the benefits of regular physical activity countering the symptoms and disease risks resulting from physical inactivity [66,67,78-82]. The evidence that exercise is effective in improving the physical capacity and muscular strength in manual wheelchair users is particularly strong [66,67,78,79,81]. Positive effects of multiple training methods (interval, endurance, etc.) on the wheelchair propulsion capacity of manual wheelchair users has also been observed [83]. Muscular strength and endurance are extremely important for

PWD to maintain independence and high functional capacity. Albeit many of the studies examining the benefits of exercise in PWD use methods of highly structured training protocols, very small increases in activity have been noted to be effective. A growing amount of literature has observed very small increases in physical activity, without weight loss, can lead to improvements in key health markers, such as blood lipid profiles, insulin resistance, and blood pressure [84,85]. A review of the literature identified that physical activity levels are just as, if not more important than, in reducing risk of cardiovascular disease, coronary heart disease, and stroke, overall physical fitness levels [86].

2.2.4 Social and Psychological Benefits of Physical Activity in PWD

While the physical benefits of physical activity are important, perhaps of more critical value are the social and psychological benefits. PWD often have difficulty developing positive perceptions of ability, self-confidence, and social competencies due to society's stigma of physical disability [30,74,87]. For years, PWD have also been noted to experience a lack of social acceptance or feelings of social isolation by peers [87,88]. These negative consequences are postulated to result from limited accessibility for PWD, negative social attitudes and behaviors towards PWD, and even objectification of PWD, such as the promotion of "inspiration porn" [88,89]. Worsening these consequences, PWD are also at a heightened risk of stress, anxiety, depression, and low perceptions of QOL [89-92]. Fortunately, much of these risks and harmful effects caused by society have been found to be greatly reduced or even removed through participation in LTPA.

Physically active PWD report having higher perceptions of self and levels of confidence in abilities as outcomes of physical activity participation [93,94]. Through participation in LTPA, multiple studies have observed PWD experience a 'redefining of abilities' and improved

perceptions of self [87,95-97]. Additionally, physically active PWD report reductions in stress levels, feelings of depression, pain, and anxiety [98,99]. These findings have been particularly important for PWD suffering from chronic pain, depression, and PTSD, such as military veterans[97,100]. Many of these benefits also have mediating associations, which in turn improve perceived energy levels, SE for activities of daily living and exercise, and overall quality of life for PWD [101].

Importantly, participation in LTPA also has profound social effects. With increases in confidence and abilities from physical activity participation, PWD report feeling less stigmatized by peers, more confidence in social interactions, and increases in social interactions, bonding, and friendships [11,87,97,102]. PWD also report feeling less socially isolated from peers and enjoying interactions that result from physical activity participation [93-95,101,103]. These social benefits, specifically, have been noted to have positive effects in both social and professional settings [11,101,104].

2.2.5 Barriers to Physical Activity in PWD

It is well known that PWD are less likely to meet the minimum physical activity recommendations for health due to numerous barriers. The common environmental barriers adults with physical disabilities report to participation in LTPA include lack of transportation, attitudinal barriers of professionals and peers, and alarmingly, inaccessible facilities or equipment [11,31,37,55,105,106]. According to the Americans with Disabilities Act, all public buildings and transportation are required to be accessible to PWD [107,108]. However, in research by Rimmer, focus group interviews with PWD, fitness and recreation professionals, architects, and city planners revealed that lack of ADA compliance and accessibility of facilities often acted as definitive barriers to IWD participation in recreational physical activity [37,109]. A study examining the accessibility of recreational facilities in Ontario, Canada, found that none of the 44

'accessible' facilities were completely accessible to PWD [110]. Most of the facilities scored very low in the accessibility ratings of their bathrooms, locker rooms, and swimming pool accesses [110]. In a study examining the ADA compliance of physical activity facilities in Oregon, no facility was observed to completely meet the required ADA standards [111]. Moreso, only 8% of the facilities examined met the requirements for accessible walkways to and around exercise equipment or areas [111]. Architects and city planners reported that ADA regulations and building codes are often not enforced and require legal action to force facility owners into compliance [31,109]. In a study specifically examining youths with physical disabilities, participants reported a lack of accessible facilities to exercise with peers, as well as misconceptions about their condition and abilities to be influential to physical inactivity levels [105].

Internal and personal barriers have also been known to largely influence PWD participation in physical activity. For PWD, the most common personal barriers to physical activity are lack of time, pain or limitations from their disability, lack of motivation, lack of self-discipline, and the amount of time involved to complete physical activity [31,101,105,112]. Pain and fatigue resulting from an individual's disability are the most common personal barriers to physical activity [101]. Another common personal barrier to physical activity in PWD is low level of SE. Similar to many other populations, SE directly effects behavior in PWD [47,113,114]. For many with disabilities, SE can be adversely affected by numerous experiences, such as negative societal perceptions of disability, lack of experiential opportunities, social isolation, and low self-perception or misconception of ability [105,115]. During interviews with adults with spinal cord injuries (SCI), participants reported that rehabilitation did not prepare them for participation in physical activity [116]. Many PWD report not knowing how to be physically active[101]. Furthermore, low perceptions of social support from peers or professionals can reduce physical

activity levels in PWD [101]. Commonly, society perpetuates a misconception of ability in PWD through the presentation of "Hero Syndrome". This theory states that non-disabled peers perceive PWD performing ordinary or daily tasks, such as being physically active or going out in social settings, as "extraordinary" and "inspiring" [11,96,117]. These reactions often perpetuates the negative perception of disability and distances PWD from capable of performing 'normal' daily activities, exercises, or sports [11].

2.3 Theoretical Models for Research Design

2.3.1 ICF Model of Disability

The WHO ICF model is arguably the most updated and comprehensive model of disability [44,45]. The ICF model, much like previous Functional and Environmental models [118-120], examines the dynamic interaction of PWD with their environment, social surroundings, and personal factors. However, the ICF is a biopsychosocial model, integrating aspects of the Medical Model of Disability and the Social Model of Disability [121]. Aspects of health, functioning, participation, environment, and personal factors are all incorporated to better examine influences to and outcomes of participation [44,121]. Importantly, the ICF model acknowledges that performance of an activity is reliant on functioning within society, not limitations of a disability itself [121]. In this model, it is theorized that performance of a specific activity is not limited to biology or the individual's disability, but results from dynamic interactions between health conditions (diseases, disorders, and injuries) and contextual components [44,121].

Contextual components consist of two pieces: personal and environmental factors. Environmental factors are considered to be external influences to action and can be further

broken down into physical, social, and attitudinal environments. Variables in these environments have a positive or negative influence on an individual's performance of a specific task, as well as outcomes of the task itself [44]. These environments are categorized at either the individual or societal levels. For example, a societal, social environmental barrier would be the inaccessibility of an individual's work environment, such as a building lacking a ramp, instead of stairs, for a person in a wheelchair. Theoretically, these factors create an obstacle outside of the biological disability itself [44,45]. For this dissertation, these factors are considered external, environmental factors or influences to LTPA participation and emphasized in Chapters 4 and 5.

The second conceptual concept, personal factors, is identified as the individual background of a person's life and living. Importantly, personal factors consist of specific features of an individual that are not a part of their health, health condition, or health state [44]. These factors include an individual's gender, education level, career, personality characteristics, behavioral patterns, relationship status, and more. These factors are considered in the demographic data collection portions of each study in Chapters 3, 4, and 5.

2.3.2 Social Cognitive Theory

The Social Cognitive Theory (SCT) provides a basis for understanding the factors influencing behavior and behavior change. The primary emphasis of SCT is the interaction between individuals and their environments, taking into consideration personal beliefs and behaviors, social support, and environmental factors [46]. Although the SCT takes environments into consideration for behavior, the primary focus of the theory is how individuals are able to make decisions within their environment to accomplish personal goals. Although the research on the influences of SCT constructs and SCT based interventions is very limited in populations of PWD, research on individuals with muscular sclerosis has extensively demonstrated the

effectiveness of SCT based interventions and SCT constructs on exercise adherence [122-127]. Of the known studies investigating the SCT and PWD, two of the five components of the SCT, SE and SR, been found to be strong predictors of physical activity participation in PWD and non-disabled college students [47,48,123,128-130].

Within the category of Psychological Determinants of Behavior is SE, or an individual's belief about their capacity to influence their behavior and events. Until recently, SE has been considered one of the largest contributing factors to an individual initiating or completing a behavior [46,47,131-133]. In SWD, specifically, SE is considered an individual's belief of whether they are able to initiate and perform certain types and durations of LTPA [47,115]. Understanding that a SWD's SE may be much lower for new activities and types of LTPA is pertinent for helping overcome barriers to participation.

In more recent studies SR has been observed to be a strong, direct influence of LTPA participation, primarily in PWD [47,134]. SR focuses on an individual's acquisition and management of skills or abilities needed to prepare and perform certain activities, including aspects of self-monitoring, goal-setting, and social support [46]. For PWD, the ability to plan or prepare for LTPA participation often trumps the influence of other constructs, including SE, because complex preparation and planning is needed to perform activity. As noted by Ginis and colleagues [47], PWD may need to plan physical activity participation around bowl or bladder self-care routines, accessible transportation, personal attendant availability, etc. Even moreso, SWD must schedule their LTPA around courses, available activities, and any other academic responsibilities they may have [11]. Therefore, regardless of an SWD's belief (SE) that they may be able to complete a LTPA, the limitations of preparing for and organizing participation in LTPA may trump that belief.

A third significant determinant of LTPA participation is an individual's outcome expectations [46,47]. Outcome expectations are an individual's perceived outcomes that might result from a specific behavior and the value of those outcomes [131]. Although SWD receive similar, if not greater, benefits of physical activity participation compared to their able-bodied counterparts, the cost in terms of preparation, effort, and time are often very cumbersome [11,31,47,115]. In a study by Devine [11], SWD reported the amount of work to travel to the university recreation center, prepare for the class, and get to the exercise room was so exhausting, they could hardly participate once there. In order for effective intervention and LTPA promotion to occur, it is necessary to understand the costs and value of LTPA in SWD. These primary concepts of SE, SR, and outcome expectations from the SCT are considered to be internal personal influences to LTPA participation for this dissertation. These concepts are emphasized in the design and research of Chapters 3, 4, and 5.

2.4 College Enrollment of Individuals with Disabilities

According to results from the 2010 Census Bureau, 5.9%, or about 1.1 million, of undergraduate students enrolled at post-secondary institutions have a physical disability [12]. Movements, such as the Americans with Disabilities Act of 2008, Healthy People 2010 and 2020, recent additions to the 2010 ADA standards, and the Post-9/11 Veterans Assistance Act of 2008, are anticipated to cause this number to rise even further [12,135-137]. In 2008, it was estimated that over 2 million veterans returning to the U.S. would enroll in postsecondary education, many likely suffering from disabilities as a result of military service [137]. Vance and Miller [138] surveyed 1,202 veterans attending postsecondary colleges and found that 10% of the sample reported having a physical disability.

Although SWD populations are increasing, SWD still attend postsecondary education at lower rates than their non-disabled peers. A report by the U.S. Department of Education stated only 22.3% and 29% of high school students with orthopedic impairments and deafness/blindness, respectively, enroll in a 4 year university following high school [139]. Only 24% of youths with disabilities continued onto postsecondary education, in comparison to 41% of their peers without disabilities [139]. SWD have also been observed to have greater attrition rates than those of their able bodied peers [3,5,140].

2.5 University Student Participation in LTPA

2.5.1 Models of Participation

Tinto's Model of Retention [6,7] and Astin's Theory of Involvement [33], theorize that university students benefit more from their university when they participate in their campus community. Tinto's early works [6] proposed that students' adherence to a university is largely influenced by their integration, both academically and socially, into their campus community. Throughout years of work, Tinto emphasized that social integration during the college experience is a key determinant to a student's commitment to a university [7]. The within-university peer culture, both in occurring in the classroom and in recreational activity settings, promotes student involvement and ultimately results in persistence to graduation [6,7,141,142].

Similarly, Astin [33] theorized that students' personal development and learning is influenced by both the quality and quantity of their engagement in the campus community. Astin's original model suggests five basic constructs, explaining that the extent of physical and psychological components in the environment, paired with the degree of student involvement help to provide cues to develop more effective programs for student retention and success [33,64].

These basic constructs include: 1) student investment of both physical and psychological energy, 2) student involvement occurs along a continuum of different degrees, 3) student involvement has both qualitative and quantitative features, 4) the amount of student learning and personal development is directly proportional to student involvement levels, and 5) the effectiveness of educational policy directly relates to its effectiveness in increasing student involvement [33]. Not included in the five basic constructs, the last two constructs are important in the successful design and implementation of educational policy and programming. Further research on these two constructs is recommended to better determine how the theory of student involvement and policy can be applied to successful student outcomes, in physical, social, and academic domains [33,141].

These theories assisted in the development of research questions and design for this dissertation. The following literature has been used to refine the scope of the dissertation aims.

2.5.2 Benefits of LTPA Participation in University Students

2.5.2.1 Social Benefits

Research has continued to support Astin's and Tinto's theories, suggesting that campus recreation centers and activities have a significant influence on student social inclusion and retention to a college campus [1,5]. In fact, students indicate that the presence and quality of a campus's recreation program is highly impactful to their decision of which university they should attend [8,143]. Students believe that recreational programs are important for developing social and peer networks [102,144,145]. It is suggested by Bryant and colleagues [144] that recreational LTPA may be the single most common bond between incoming students. As many incoming

freshman report having participated in athletics or LTPA during high school, continuing that interest is believed to be an integral part of a successful transition into college [146,147].

Along with building social inclusion, LTPA participation has been linked to benefits that are critical for success in social and occupational situations. With participation in campus recreational activities, students report benefits of developing strong cooperation and communication skills, respect for others, and feelings of belonging or association [145,148]. Students also report increases in feelings of social adaptation and belonging, confidence with diversity, and participation in other activities around campus [1,5,34,102,142,145,148-151]. In a study by Henchy [5], over 34% of students surveyed felt that participation in LTPA greatly improved their feelings of belonging and association to the university. Additionally, Belch and colleagues [3] observed that many students thought recreational programs gave them the opportunity to develop informal support groups, find study partners, and gain advice from both faculty and other students. Students also reported that they participate in LTPA more to increase their social experiences and their connection to others, than for the activity itself or health outcomes [140]. These social experiences and benefits are attributed to the diverse social interactions students are often unable to experience regularly, outside of the campus community.

2.5.2.2 Social Benefits in SWD

Involvement in LTPA has been also observed to have positive effects on social stress reduction and peer integration of SWD, specifically [76,77]. Based on her qualitative research, Devine postulates that because SWD often do not participate in LTPA or clubs within their

campuses, they can lack social inclusion, which potentially decreases social acceptance by their peers [11,30,77]. Results of a survey based study at multiple England universities revealed although students without disabilities were supportive of reducing discrimination against SWD, they reported having limited knowledge or social experience with individuals with disabilities [3,152]. Concerningly, over 60% of the students without disabilities could not recall whether there were any PWD at their last school. Students without disabilities also reported negative feelings of ignorance, confusion, and guilt of not knowing how to interact with their peers with disabilities [118,119,152]. These common feelings of students without disabilities directly conflict with the results of a focus group, in which SWD stated feeling accepted and belonging in their college setting was of utmost importance [120]. Additionally, SWD reported being very aware of the feelings of their non-disabled peers and felt that their physical and social restrictions hindered their inclusion on campus [152]. Miller and colleagues [5] found that participation in LTPA was essential for creating a social bond between students, increasing their trust and commitment to their peers. Social connections are recognized to increase feelings of social acceptance in SWD, helping to decrease perceived social barriers and negative self-perceptions [115].

As aforementioned, PWD report lower perceptions of QOL (QOL), SE, life satisfaction, and abilities [16,44,45,115]. Specific to physical activity, participation in LTPA has been observed to increase perceptions of ability, enhance body image and confidence in women with physical disabilities [115]. As described by Devine [11], college campuses are becoming incredibly diverse, and have begun to train and prepare students for their future workplaces and communities. Inclusion in college campus LTPA can help to better prepare students, both with and without disabilities, for their life after college by increasing their social confidence through acceptance of diverse populations. Inclusion is also postulated to be beneficial to non-disabled students to

minimize negative perspectives of disability and decrease social barriers [30]. Feelings of inclusion and social confidence are particularly significant for SWD, as recent reports indicate only 56% of college graduates with disabilities are employee in comparison to over 90% of graduates without disabilities [153]. It is theorized that social stigma, negative perceptions of disability, low SE, low self-confidence, and social isolation may play a roll in this [11,153].

2.5.2.3 Behavioral Benefits

Multiple studies have found links between students' LTPA participation on campus and the development of healthy behavioral patterns carried into adulthood [1]. Most importantly, students who regularly participate in their campus community and recreation programs are more likely to perform well academically, commit to attaining a college degree, and graduate [154-156]. Misra and Mckean [157] found that many students reported significantly reduced academic stressors as a benefit of participation in LTPA. These stressors included academic conflict, change, and frustration [157]. In similar research, students have indicated improvements in time management, academic performance, and stress reduction as a result of LTPA participation [3,5,156,158,159]. Over 51% of students surveyed at a particular university stated that their overall wellbeing was improved by participating in LTPA [5]. These benefits are postulated to occur because LTPA participation engages students in behavioral, cognitive, and affective tasks aimed to achieve self-fulfillment and QOL [1,5,102,159,160]. The literature recognizes that social interactions, specifically in the form of acceptance, is pertinent to a student understanding who they are, the meaning of behaviors, and how they fit into their social world [30,115]. These behaviors, increases in sense of self, and personal confidence are carried past graduation and often into future workplace settings [1,33].

LTPA participation during university years also benefits physical activity levels carried into adulthood. An extensive study on the physical activity levels of college alumni found that 85% of individuals who regularly participated in LTPA during their senior year of college considered themselves to be just as, or more active at the time of the survey (mean time of 6.2 years post-graduation) [161]. Alarmingly, those who did not regularly participate in LTPA during their senior year of college reported having about the same activity levels or less at the time the survey was taken [161]. The study also found that alumni who reported engaging in regular LTPA had less weight gain post-graduation than their physically inactive counterparts [161].

2.5.2.4 Behavioral Benefits in SWD

Little is known about the academic, adherence, and graduation rates of SWD who participate in LTPA. However, it has been observed that SWD who participation in LTPA during college are more likely to be physically active after graduation [162]. Aside from disability severity, physical activity level during college was the only noted predictor in a sample of 229 university alumni [162]. In a qualitative study on the outcomes of male SWD in LTPA, it was also observed that participants reported feeling empowered and more able to achieve goals [94]. This outcomes may translate into academic and work performance, however further research is necessary.

2.5.3 University Student LTPA Participation Levels

In light of research demonstrating student benefits of LTPA participation, universities have begun to provide a broad range of LTPA options for students, such as state of the art recreational exercise facilities, fitness classes, intramural sports, and outdoor activity courses. In

a 2005 survey of campus recreation directors, it was noted the primary emphasis for recreational activities was placed on intramural sports, followed by open recreation, group exercise classes, and club sports [9]. Acknowledged as still important, less emphasis is placed on instructional programming, youth and family, special events, and club sports [9]. Likely as a result, reports in recent years have found that 70-88% of both full- and part-time able-bodied college students take part in LTPA on their college campuses [7-10]. Most commonly, students report participating in open recreation (46%), intramural sports (37%), and group exercise classes (18%) at their campus recreation facilities [9]. Although these reports outline specific student demographics, grade point average, marital status, etc., they give no indication of the percentage of SWD participating in these activities.

Only one known study has examined the LTPA participation levels of SWD [32]. Researchers observed nearly 40% of SWD surveyed never used their campus recreation facilities and 30% used facilities less than five times a semester [32]. A mere 15% of SWD surveyed used their campus recreational facilities more than 16 times a semester [32]. This is in line with previous literature, finding that SWD who participate in LTPA or athletics during high school tend to experience a drop-off from these activities once they enter college and adulthood [43,147,163]. As the population of SWD continues to grow, this data is becomes more concerning as it gives indication that the SWD activity levels may mirror those of IWD.

CHAPTER 3: A MIXED METHODS EXPLORATION OF HOW UNIVERSITY STUDENTS WITH PHYSICAL DISABILITIES PERCEIVE PHYSICAL ACTIVITY AND THE INFLUENCE OF PERCEPTIONS ON PHYSICAL ACTIVITY LEVELS

Dysterheft, J. L., Lindahl-Lewis, P., Hubbard, E. A., Jones, O., Rice, L., & Rice, I. (2016). A mixed methods exploration of how university students with physical disabilities perceive physical activity and the influence of perceptions on physical activity levels. *Cogent Medicine*, 3 (1). DOI:10.1080/2331205X.2016.1196809

3.1 Abstract

The purpose of this study was to investigate university students with physical disabilities' (SWD) perceptions of physical activity (PA) and how these perceptions may influence activity levels. Using reliable and validated surveys with in-depth interviews, researchers examined the perspectives of 13 undergraduate SWD regarding PA in the context of their university environment. Four quantitative surveys were used to understand participants' health practices (SRAHP), exercise self-efficacy (EXSE), barriers to PA (BARSE), and outcome expectations for PA (MOEES). To gather richer, exploratory data, interviews were focused on answering how do SWD perceive and define PA, and what factors influence their PA participation? Correlational analysis and independent t-tests were used to examine survey outcomes. Interviews were analyzed using thematic analysis and line-by-line coding strategies. Quantitative analysis revealed correlations between all MOEES surveys, as well as the EXSE, BARSE, and SRAHP. Analysis of the surveys and interviews resulted in two primary themes and seven subthemes. The first primary theme, Personal Perceptions of PA, had two subthemes: Personal Definitions and Personal Practices. The second theme, Influences on PA Participation, consisted of five subthemes: University Assistive Resources, Aspects of Personal Well-being, Symptoms and Physical Limitations, Time and Scheduling, and Social Inclusion. Results from this study helped

to understand how SWD identified with PA and identified both motivations and barriers to PA unique to SWD. Data from this study can be used to improve accessibility and disability programming for SWD to promote PA.

3.2 Introduction

According to the Annual Disability Statistics Compendium in 2013, almost 13% of the United States population had a physical disability [164]. In 2010, about 1.1 million of the those persons with physical disabilities (PWD) were students attending post-secondary institutions in the U.S., making up almost 6% of the undergraduate population [12]. The occurrence of severe physical deconditioning has been thoroughly studied in PWD and is known to be a crucial health issue. For example, less than 30% of adults with physical disabilities participate in regular, aerobic physical activity and only 15% participate in regular resistance training each week [13,14]. Lack of regular physical activity and exercise often leads to overuse injury, pain, and chronic health implications, such as cardiovascular disease and diabetes [17,19,22,23,25,65,68]. Compounding the problem, many PWD are at an increased risk for developing secondary complications due to sedentary lifestyles, including osteoporosis, increased spasticity, high blood pressure, obesity, anxiety, depression, decreased quality of life, and poor activity tolerance [17,24,26,56,61,71,72,91,165,166]. Of equal importance, inactive PWD are also at heightened risk of feelings of social isolation, lack of acceptance by peers, and negative self-perceptions, which can directly conflict with success in the workplace and social circles [11,30,55,74,75,77].

Unfortunately, similar to adults with disabilities living in the general population, university students with physical disabilities (SWD) are proposed to participate less in physical activity than their able-bodied peers [11,13,14,32,47]. While reports estimate that 78-88% of able-bodied university students participate in recreational physical activity on their campus [7,51,62],

Yoh, and colleagues found that almost 70% of SWD use their campus recreation gyms and facilities less than five times each year [32]. Even SWD who participate in leisure time physical activities or athletics during high school are more likely to experience a drop-off from those activities once they enter college and adulthood [43,147,163]. These numbers are particularly alarming, as research has demonstrated that long-lasting healthy lifestyle behaviors, both physical and psychological, are often developed during an individual's university years [161,167-170]. Participation in campus recreational physical activity also encourages healthy physical, physiological, and social behaviors in students [5,79,80,115]. Additionally, recreational physical activity participation can result in better adherence to academic programs, academic performance, and perceived social integration [1,5,33,34]. These benefits may be particularly important for SWD, as they have been reported to have greater university attrition rates, feelings of stress, and social isolation than their able-bodied counter parts [5,76,77,145,171].

Numerous studies have attempted to clarify why physical activity levels remain low in adult PWD despite the known benefits of exercise [11,31,47,172]. Researchers have found that negative self-perceptions and low self-efficacy, outcome expectations, and self-regulation are major barriers to physical activity participation [35,47,173]. Low levels of exercise self-efficacy, outcome expectations, and high barriers to exercise have been observed to also negatively influence perceptions of physical activity [47,49]. Additionally, adult PWD in the general population have reported high costs of equipment and facilities, lack of knowledge and available information, and a lack of resources, such as transportation and facilities as major barriers to being physically active [11,31,115,174]. However, little is known about the factors influencing physical activity participation in SWD during their college years. Given that many of the aforementioned barriers to physical activity adults with disabilities report are provided to students attending

universities (available facilities, transportation, recreation opportunities at no additional cost), it is unclear why activity levels amongst SWD still remain low [31,32,37,38]. This may indicate that internal features like personal perceptions to physical activity are more influential to participation levels in SWD then previously speculated.

Due to vast lack of literature examining SWDs' influences and perceptions of physical activity, the purpose of the present study was to qualitatively investigate SWDs' perceptions of physical activity and how these perceptions may influence their activity levels. This study uses a mixed methods design to explore the knowledge and perspectives SWD have on physical activity and exercise at their current university. Quantitative surveys were used to examined SWD personal characteristics and beliefs on physical activity to determine underlying personal influences to physical activity participation. Qualitative interviews were focused on two primary questions: 1) What are SWDs' personal perceptions and knowledge of physical activity, and 2) What are SWDs' primary influences to participation in physical activity? These questions were chosen to help understand what SWD consider to be physical activity and how they personally perceive physical activity. Additionally, these questions were used to determine what influences exist at a disability-accessible university that contribute to their participation in physical activity. The information from these interviews may explicate what internal and external factors drive physical activity participation in SWD, a population at high-risk for physical inactivity and deconditioning. A comprehensive understanding of the perceptions and needs of SWD is essential to make effective changes that have a lasting impact both at the postsecondary education level and later in life [35,36].

3.3 Methods

3.3.1 Study Design

A mixed methods research design was implemented where validated surveys and semi-structured interviews were used for data collection on 13 university students with mobility limitations do to physical disabilities. A mixed methods approach allows for more extensive examination and interpretation of data collected. Additionally, complimenting survey data with explanatory interviews may strengthen the results found [175,176].

All surveys were reliable and previously validated examining exercise self-efficacy, outcome expectations, barriers to exercise, and health practices [152,177-179]. All interviews were analyzed using thematic analysis [180,181]. Semi-structured interviews with open-ended questions were chosen as we aimed to obtain the individual perspectives and experiences of the participants. We acknowledge that analysis of qualitative data is subject to researcher interpretation and bias [182]; therefore, for this study we aimed to understand our own experiences, opinions, and expectations, to better recognize and minimize bias in analysis of the data.

3.3.2 Participants

The study protocol was approved by the university institutional review board. A sample of SWD was recruited from a Midwestern University, recognized for its long standing commitment to SWD including campus accessibility, extensive student services for SWD, and adapted athletic sports programs. Participants were recruited through information provided to the Division of Disability Resources and Educational Services (DRES), athletics coaches/administrators of adapted sport teams, the Interim Director of Residential Support Services, as well as flyers posted within university housing and facilities. Inclusion criteria for participation were: a) 18+ years of age, b) currently a student at the participating University, and c) identified as a person with a physical disability. A total of 15 SWD volunteered and were

screened for the study. Two students did not respond for interviews, resulting in a final sample size of 13 participants.

3.3.3 Demographic and Quantitative Measures

Data collection was separated into two sessions, set one week apart. During the first session, informed consent and basic demographic information was obtained. Additionally, to better understand the sample, participants completed multiple reliable and validated survey tools measuring exercise self-efficacy, outcome expectations, barriers to exercise, and health practices (*see table 1 for demographics and survey results*).

Exercise-specific self-efficacy was measured through the Exercise Self-Efficacy (EXSE) scale [178]. The 8-item EXSE scale examines an individual's belief in their ability to participate in 40 minutes or more of moderate physical activity three times per week in one-week increments, for the next 8 weeks. Scores range from 0-100, higher scores indicating greater exercise self-efficacy. The EXSE has been found to be reliable and valid measure for exercise self-efficacy, with high internal consistency estimates in PWD and older adults [122,178,183] (*see Appendix for EXSE*).

Exercise outcome expectations were measured through the Multidimensional Outcomes Expectations for Exercise Scale (MOEES) [177]. The 15-item scale contains three subscales of outcome expectations: Physical, Social, and Self-Evaluative outcome expectations. The scores of each subscale are summed and form measures of outcome expectations. Scores ranges for each of the subscales are as follows: Physical: 6-30, Social: 4-20, and Self-Evaluative: 5-25. Higher scores indicating greater outcome expectations in each subscale for exercise. The MOEES has

been found to have adequate internal consistency, with excellent validity and reliability in PWD and older adults [125,184] (*see Appendix for MOEES*).

Barriers to exercise were measures through the Barriers Specific Self-Efficacy Scale (BARSE) [179]. The BARSE is a 13-item scale that identifies a participant's perceived capabilities to exercise three times per week for 40 min over the next two months when facing commonly identified barriers. The scores range from 0-100, higher scores indicating greater ability to overcome barriers. The BARSE has been found to have excellent internal consistency, with acceptable validity and reliability in PWD and older adults [179,185] (*see Appendix for BARSE*).

Participants' self-perceived ability to implement health promoting behaviors was measured through the Self-Rated Abilities for Health Practices Scale (SRAHP) [152]. The 28-item, 5 point scale, contains four subscales of exercise, nutrition, responsible health practice, and psychological well-being. The scores of each subscale are summed and form measures of ability to perform health practices. Scores range from 0-112, higher scores indicating greater ability to perform health practices. The SRAHP has been found to have high internal consistency, with acceptable validity and reliability in PWD and undergraduate students [152] (*see Appendix for SRAHP*).

3.3.4. Interview Protocol

During the second session, participants completed one, individual interview to allow personal elaboration and details. Interviews were conducted with the purpose of capturing rich, personal information beyond what surveys may be able to provide. The information collected during the interviews was used to compliment data collected from the surveys and allow for deeper analysis and interpretation. Interviews were conducted in a quiet, private conference room

using a semi-structured interviewing protocol. Formal initial, intermediate, and ending questions were developed prior to data collection, using intensive interviewing strategies and grounded theory to gather rich data from participants [181,186]. Interview questions focused specifically on physical activity and exercise, to obtain participant activity levels, perceptions, barriers, motivators, and other influences. Sample interview questions can be found in table 2. Multiple researchers conducted interviews with participants to minimize bias of intermediate questions and interview focus. All researchers used the same formal initial questions (*see table 2*), but were allowed the freedom of intermediate questions to direct conversation and probe participants for elaboration and greater insight to opinions and experiences. Interviews lasted an average of 60 min, were audio recorded using a digital recorder (Sony ICD-PX312 Digital Voice Recorder, Sony Corporation, New York, NY, USA). At the end of each interview, participants were given the opportunity to add any additional thoughts they may have on the interview topics of physical activity and exercise. All interview questions are listed in the Appendix.

3.3.5 Data Analysis

3.3.5.1 Quantitative Analysis

Analyses of the survey and demographic data were conducted using IBM SPSS Statistics, Version 22 (SPSS, Inc., Chicago, IL). The primary quantitative analysis estimated the associations between the three MOEES scales, EXSE, BARSE, and SRAHP and demographic variables of age and years of schooling using Spearman's rho correlations analysis. The magnitude of the correlations were interpreted as small, medium, and large based on values of 0.10 to 0.29, 0.30 to 0.49, and 0.50 to 1.0, respectively [187]. Using Shapiro-Wilks tests, all data was found to be normally distributed, therefore independent t-tests were used to determine if gender had significant influence over survey scores. Significance for all correlations statistics

was set at $p \leq 0.05$. As four independent t-tests were run, a Bonferroni correction was used to determine a new p-value of $p \leq 0.01$. All description statistics are reported as mean (M) and standard deviation (SD). Range (R), Interquartile Range (IQR), and Median (Med) are be reported for variable scores in table 3.

3.3.5.2. Qualitative Analysis

All interviews were transcribed verbatim by a researcher who did not conduct that specific interview and then read over by the interviewing researcher to verify for accuracy. Thematic analysis was first performed by three coders to identify, analyze, and interpret common primary themes found in the data [180]. In accordance with Corbin and Strauss [181], the coders used line-by-line, open coding strategies on the first five interview transcriptions to develop categories of most importance based on the data. Next, for further examination, coders re-read the transcriptions and developed subthemes within each primary theme.

Once recurring themes and patterns relating to the original research questions were found, a codebook was developed to analyze the remaining eight interview transcriptions. The initial five interview transcriptions were also reanalyzed using the final codebook. All final coded transcriptions were checked for consistency amongst coders in addition to an auditor. The auditor was a researcher who did not take part in interviewing or coding. Their primary responsibility was to examine final codes for bias, discrepancies, and address any outstanding data concerns. Any discrepancies were discussed to address possible researcher bias and generate consensus on coding [180,186].

To maintain rigor during the qualitative analysis, multiple methods were used to insure credibility and transferability of the results. In using a standardized, semi-structured interview in

which all researchers were required to follow, we maintained reliability of data collection. Mixed data was compared using multiple triangulation in the combined use of survey, demographic, and interview data to reveal complimentary findings [188,189]. Finally, researchers searched for negative cases, or outliers, to determine if any participants or data were not consistent with the emerging themes.

Although these measures were carried out to ensure the credibility and transferability of the data, caution should be taken when generalizing the results to other SWD that may function differently in other environmental contexts. When considering researcher bias with regards to the credibility and transferability of the data, there is no perfect separation of the researchers from the participants [190]. It should be noted that one of the interviewing researchers may have interacted with the participants previously as an instructor for an unrelated course. All other researchers had no direct prior relationship with the participants, and had no personal or professional obligations that would have led to the coerced participation in this research study.

3.4 Results

The participant population was predominantly female (*n* = 8), Caucasian (*n* = 11), and full-time students (*n* = 11) (table 1). The participant population had a mean age of 23.69 SD 5.68 years and attended the participating university for 2.50 SD 2.33 years. Cerebral palsy was the most common cause of disability (*n* = 7), followed by muscular dystrophy (*n* = 3), and Friedreich's ataxia, scoliosis, and transverse myelitis (each *n* = 1). All participants, except one had been living with their disability for at least 10 years at the time of data collection. Almost half of participants (*n* = 6) used a combination of power and manual wheelchairs for modes of propulsion.

3.4.1 Quantitative Analysis

Participant sample M, SD, R, IQR, and Med survey scores are reported in table 3. All correlations are reported in table 4. Results of the independent t-tests showed no significant differences between male and female survey scores: MOEES Physical: $t(13) = 0.488$, $p = 0.64$, MOEES Social: $t(13) = 1.07$, $p = 0.31$, MOEES Self-Evaluative: $t(13) = 0.59$, $p = 0.95$, EXSE: $t(13) = 0.72$, $p = 0.94$, BARSE: $t(13) = 1.18$, $p = 0.26$, and SRAHP: $t(13) = 1.35$, $p = 0.21$.

3.4.2 Qualitative Analysis

During the analysis, it was noted that students often used the terms physical activity and exercise interchangeably. Therefore, to avoid errors in interpretation, the term "physical activity" will include both definitions of "exercise" and general "physical activity".

Analysis of the interview transcriptions resulted in two primary themes and a total of seven subthemes based on 21 codes. Research questions, primary themes, subthemes, and codes are reported in table 5.

3.4.2.1 Theme 1: Personal Perceptions of Physical Activity

During the interviews, participants were asked to discuss their personal definitions and beliefs about physical activity, as well as their own physical activity levels.

Personal Definitions. Many participant definitions of physical activity stemmed from conventional descriptions, such as "anything that gets your heart rate up" or "anything that keeps your body moving". Interestingly, when asked to provide examples of what they believed to be physical activity most participants reported activities they were unable to currently perform. For example, a few participants who relied predominantly on power wheelchairs for mobility cited

examples of running or roller skating. Some of the participants also seemed to lack confidence when providing their personal definition of physical activity. Often, participants would give their personal definition, immediately followed by statements such as “I don’t know”, “I’m not sure if that’s what you consider physical activity”, or “I don’t know if that’s considered physical activity”. Participants often expressed that their physical activity and exercise primarily came from performing activities of daily living (ADLs), such as personal care, transferring, attending class, and participating in social events. One female student described cheering at a sporting event as an activity that she considered to be exercise.

This theme expanded into participants discussing their personal beliefs of physical activity. For example, when asked what she personally views as physical activity, one participant with cerebral palsy explained,

> I don't physically walk, but it does take energy to drive, you know, down the block or across campus. I think that's considered physical activity too. I know it sounds ridiculous, but on my physical activity sheets, whenever I drove home, I didn’t drive, I just road in the car, but I put a 7 for that. Because just sitting in a car is physically exhausting to me. I don't know why, but it just makes me really tired [participant referenced using a physical activity recall survey with Rate of Perceived Exertion score (1-10)].

Another female participant with cerebral palsy described,

> …what I perceive as my physical activity is the walker. I feel like I get pretty good exertion and workout because by the end of it, I'm breathing heavy and I have broken into a sweat…I need water. It's almost like my version of running (laughs), except it's much slower than the others.

Additionally, many participants expressed that what they believed to be physical activity for themselves was much different than what it may be for a person without physical disabilities. One example of this was a response by a male student with muscular dystrophy: “anything I

consider physical activity is just your [individuals without physical disabilities] regular day to day things, like going to class or just like socializing".

Some participants expanded on these differences, and seemed to feel that physical activity wasn't something they were able to perform. One male with muscular dystrophy stated:

> I don't really personally identify with that word just [because] I picture exercise as like being at the gym or, you know, running or something like that. So when I say stretching, I don't really use it as exercise as what you guys would [referring to individuals without a physical disabilities]…

Personal Practices. When asked about their participation in physical activity, a majority of the students stated their physical therapy (PT) sessions, provided at the university, were a primary source of physical activity. Almost all (n = 11) of the participants reported going to PT or performing therapeutic exercises 1-2 times each week. Additionally, students reported daily therapeutic activities, such as using a walker for 30 min each day, as part of their personal practices. Some of the more common examples of exercises provided were therapeutic stretches, movement exercises for blood flow, and muscle strengthening. Very similarly to what was noted in the Personal Definitions subtheme, participants often described their physical activity practices as performing daily activities. For example, a female participant with Transverse Myelitis stated,

> I'm pretty independent, ya know, flipping on the light switch, or lifting my computer from my lap to the table, or getting it down, opening it up, writing, taking a drink and eating, cutting stuff up - if I can cut it up. I mean its all, brushing teeth, brushing hair, doing your hair, putting on makeup when I do put it on. Ya know, that kind of stuff.

Similarly, when asked what he personally did for physical activity, a male participant with muscular dystrophy stated,

> … definitely just like day to day, if I were to go out to class several hours and [be] out and about, that would definitely be burning calories and sort of a physical exertion there. So I don't really have to do anything additional than what I already do.

Only four of the 13 participants reported participating in recreational activities outside of their scheduled PT and therapeutic exercises. One of those participants was also a member of the university's wheelchair basketball team. These four participants stated they participated in numerous activities offered by the university that they enjoyed performing, such as weight lifting, aerobic classes, practicing walking, and using the treadmill, stair climber, and swimming pool.

3.4.2.2 Theme 2. Influences on Physical Activity Participation

In order to obtain more rich information, participants were asked to expand beyond their personal physical activity habits. Researchers asked participants what motivated them to be physically active, as well as what barriers to physical activity they faced. Participants were asked to expand on other individuals, physical and social resources, and personal feelings or beliefs that influenced their physical activity levels.

University Assistive Resources. All of the students interviewed addressed the influence of specific university resources on their physical activity levels. The most commonly stated influences were personal assistants (PA) and staff, such as a physical therapist, provided by the university. Only two instances occurred in which students stated that a PA was considered to be a barrier to activity. The first was when a PA was unable to physically maintain a level of aerobic activity with the student, such as not keeping pace with a power wheelchair. The second dealt more with the comfort of the student and the experience level of the PA. This is described in a statement made by a male participant with cerebral palsy comparing his physical activity levels at home to on campus,

> Physical activity is a little more involved when I'm home, but I think for here, it's like, and it's not like I don't trust my PA's, because I trust them, but I think when I'm home it's a little more involved because it's my parents and they've been doing those things ever since I was like four.

Another student described her frustration with fitness staff at the recreation center,

> When I was younger, I took a fair number of dance classes and that kind of thing and I had fun. I was in disability specific classes and that was great, but now I notice when I've taken workout classes or dance classes, my instructors…often get frustrated with my disability before I do. It will take me some time to get a move, they are like oh you aren't getting this, and I'm like I'll get it, it will just take me a few more times…

Many of the participants (n = 9) stated that their PA and PT were positive sources for physical activity participation. Participants who utilized these resources stated that the university-provided PTs and PAs helped to provide necessary assistance, beneficial information on health and activity, and motivate them to regularly perform physical activity. A female participant stated about the university, "There is a really good support system here. You know, everybody is willing to help you out and they all kind of make sure your goals and your dreams happen." It should be noted that three of the participants who did not find their PA or PT influenced their physical activity levels did not regularly practice physical activity and the fourth did not require PA or PT resources.

Aspects of Personal Wellbeing. All participants, except one, believed there are perceived physical and psychological benefits to physical activity participation. Most commonly, participants discussed stress reduction and relaxation. One male participant with muscular dystrophy explained,

> I think a lot of people think of the body and the mind as a separate thing, but having a healthy body and having physical activity [have] a huge impact on how you think and how much stress you deal with on a daily [basis], so I think if your body is less stressed, your mind is less stressed.

Another very commonly stated benefit was the feeling of accomplishment and independence gained by physical activity participation. One female student with cerebral palsy explained, “I think the biggest satisfaction is knowing that you personally feel good and, really, at the end of the day we all have to be okay with ourselves”. Another female student with scoliosis described her motivation as, “to show people that just because I have a disability, its' not going to stop me from furthering my goals and what I can do and why.” She expanded on this by stating, “I've come to realize the fact that emotional health is just as important as eating healthy and physical [activity].” Overall, six of the participants described that ‘feeling good’ or “feeling happier and healthier” both during and after physical activity were primary motivators.

Symptoms and Physical Limitations. For participants, the symptoms and physical limitations of their disabilities played very significant roles in influencing their physical activity participation. Participants often discussed the benefits of physical activity in alleviating secondary symptoms of disability. Many of these discussions on benefits stemmed from their exercises performed in PT, such as, “get my body moving so I don't get stiff or [pressure] sores from sitting in my chair” and, “[we do] traction to straighten out my spine, because that helps me breathe a little bit better.” However, participants strongly emphasized the importance of independence. A male student explained this in a response about his perceived benefits of physical activity, stating,

> Oh, they're numerous, they're numerous for me - it's being able to help my PAs or assistants here with, what I like to call them, "tasks of daily living", which are transfers or getting dressed or getting ready for bed or taking medications.

Additionally, maintaining current levels of health and preventing loss of functionality was a common motivator. A female student with Friedreich’s Ataxia explained,

> I didn't want to be in a chair because once I'm in a chair, like, then you lose so much strength that you can use walking, so that's definitely a big motivator that I want to keep being able to walk.

Participants also discussed that without regular physical activity, secondary symptoms of their disability, such as depression, balance, energy, and sleep quality often become exacerbated.

Although physical activity was stated to benefit participants, symptoms and physical limitations were also addressed as a barrier to physical activity. Some participants outright described their disability or condition as a barrier to physical activity, stating that "being in a wheelchair" prevented them from participation. Additionally, participants reported feeling limited in their abilities, one describing, "I don't think there is as much for, you know, people with more severe physical limitations." A male participant with muscular dystrophy expanded on this, stating,

> It's just, when you have a disability it's hard to get into the mindset that you can be physically active as much as…someone that doesn't have such challenges.

Another female participant with cerebral palsy addressed how her disability symptoms often discouraged her from trying new activities, stating

> I have a lot of anxiety, disability-related anxiety, of trying new things and things being more difficult for me when I start them. It's like getting in that mental state of knowing that I am going to try something that is really hard and will take me a long time and I am going to be frustrated, but I have to be ok with that first before I go on.

Furthermore, although some participants discussed maintaining independence, health, and happiness as a facilitator, a lack of these was also noted to be a barrier to physical activity.

Time and Scheduling. For almost all of the participants (n = 10), time management and scheduling was stated as an influence to participation in physical activity. Particularly, studying for exams, homework, and attending classes were cited as barriers to physical activity (n = 9). Additionally, participants addressed the amount of time it took to prepare for and complete

physical activities prevented them from wanting to participate. One female student with cerebral palsy mentioned, "Most people, when they are physically active, do so without thinking about it, whereas for me it has to be a, I mean even transferring, is a carefully planned out thing. Another female with cerebral palsy described that she didn't go swimming as often as she liked on campus because it would take more than an hour to get ready, even with the help of a PA.

Social Inclusion. Almost all (n = 11) of the students interviewed addressed their peers as an influence to their physical activity participation levels in some way. Nine of the participants stated they felt their peers positively influenced their physical activity levels through encouragement, role models/motivation, and social support. A male participant with cerebral palsy explained that when he doesn't want to exercise, he gets encouragement from his peers. In detail he explained, "We encourage each other, be like, 'no you gotta go for the benefit of your muscles', and stuff like that. I get feedback from my peers to when we encourage each other." Commonly, participants also described that performing physical activity with peers made it more enjoyable and promoted a social connection to others. The same male student with cerebral palsy explained,

> I enjoy like being able to do my exercises at DRES, not only for the physical aspect of stretching the muscles, but for that communication aspect of it as well because while we are doing that, we are talking about certain things that are going on around campus or about classes… I look at it as a holistic experience.

For some participants, not having peer support was noted as a barrier to being physically active. For instance, a female student with cerebral palsy described,

> Walking and hiking are things that I actually don't mind doing with other people - I prefer to them with other people. So if I have people to spend time doing those things with, they are more enjoyable…. I do have friends that I can do those things with, but it is a little more difficult [at the university] because if I want to do those things and there is no one to do them with, I kind of lose my motivation.

Participants also explained that their peers were often able to help them in performing any activities, as well as providing information on the benefits of being physically active.

3.5 Discussion

In numerous studies, participation in physical activity has been observed to greatly improve both the physical and psychological health of individuals with physical disabilities. This study adds to the literature aimed at better understanding university SWD and their perceptions of physical activity. We were able to address two primary questions 1) What are SWDs' personal perceptions and knowledge of physical activity, and 2) What are the primary influences on participation in physical activity that SWDs have? With this information we are able to provide rich data, answering these questions and helping build a more comprehensive understanding of the perceptions and needs of SWD. Most importantly, with the qualitative data, we were able to find differences in the factors influencing physical activity participation amongst SWD compared to their able-bodied peers and those reported to influence PWD living in the general population of PWD [31,37,38].

3.5.1 Quantitative Survey Results

Results of the quantitative analysis indicate that participants in this study had similar, yet higher survey scores to those found in previous literature [178,179,191,192]. However, it should be noted that survey scores in previous literature are of different populations, both in age and disability. Participant scores for the MOEES scales and EXSE were observed to be very similar to previous literature on PWD. However, previous literature has been focused on older populations and adults with multiple sclerosis [178,179,191,192]. Interestingly, participants' average scores for the Physical and Self-Evaluative MOEES scales were relatively high in the top 25% of

the scale ranges, but the average score for the Social MOEES scale was closer to a moderate range (56% of maximum score). This may give indication that our younger participants found physical activity to be more beneficial for symptom control/reduction, independence, and perceived abilities, over benefits to social inclusion and peer acceptance.

Interestingly, participant BARSE scores were very similar to those of college students without physical disabilities (48.30 SD 21.10 vs. 48.50 SD 22.67) [155]. Although PWD generally report more barriers to physical activity, living on an accessible campus with numerous opportunities for assistance may have contributed to higher scores. Investigating young adults with disabilities who are not living on an accessible campus may help to clarify the influence of university resources. Finally, SRAHP scores were also higher than previously reported in the literature [2,152,193]. Although both the EXSE and BARSE demonstrated moderate level scores for participant's exercise-specific self-efficacy and ability to overcome barriers to exercise, participants had relatively high average SRAHP scores (79% of maximum). These higher scores for perceived abilities to perform health-promoting practices may reflect participants placing higher importance on nutrition, happiness, stress reduction, and symptom management for health rather than regular physical activity. Specifically, diet and nutrition may be a strong intervening variable to physical activity participation. This is supported by interview data in the current study, as participants emphasized that their disability and symptoms greatly influenced their physical activity level. Some participants also stated that their diet was directly related to symptom control, which may further indicate a greater perceived importance of diet over physical activity for health. Previous studies have observed that poor nutritional habits are associated with increases in healthcare needs and decreases in activity level in PWD [194,195]. As poor nutrition can often exacerbate disease symptoms, such as joint pain, tiredness, abdominal

pain, and chronic constipation, physical activity participation may, in turn, be affected as well [196-198]. However, there is little known research on the direct relationship between dietary habits and physical activity participation in PWD. Additionally, the SRAHP does not measure the actual degree to which health practices are carried out, only whether participants believe they are able to perform them. Therefore, there results should be interpreted with caution, as further research on the intervening relationship of nutrition on activity level is needed.

As anticipated by researchers, significant correlations were found between survey measures. Specifically, all three scales of the MOEES were highly correlated, suggesting participants who perceived positive outcomes from physical activity, believed they would occur in physical, social, and self-evaluative domains. Additionally, the EXSE was moderately correlated with the BARSE. The moderate correlation found between participant's self-efficacy and barriers to physical activity support findings from previous literature. Self-efficacy and barriers to physical activity have been noted to be underlying contributing factors to PWD participation in physical activity [47]. Given that no participants reported barriers common to PWD in the general population, such as transportation or available facilities, it is pertinent to understand the existing barriers SWD face to reduce negative effects on SWD self-efficacy.

The EXSE was also highly correlated with the SRAHP. The high correlation found between the EXSE and the SRAHP indicates that SWD with higher levels of self-efficacy also have higher belief in their ability to perform health practices. Although this belief does not suggest action in practice, further research should investigate whether these beliefs relate to physical activity participation. No correlations were found between survey measures and age or years of school. This may be due to the limited sample size.

Due to the small sample size and unique university setting, all interpretations of the quantitative data should be done with caution. Future research should be performed to examine the relationships between survey scores for larger sample sizes of SWD. Additionally, further studies should be performed at universities with less disability services and accommodations to determine whether the survey scores of SWD change. Because the participating university is very unique in its commitment to SWD, these results may not apply to all university settings.

3.5.2 Qualitative Themes

In the first primary theme, Personal Perceptions of Physical Activity, it became very clear by the participants' definition of physical activity that many believed physical activity was not something they were able to do. Most participants who provided examples of physical activities that they were personally unable to perform stated a lack of association with the word and practice of physical activity. Additionally, it was noted that the same participants reported not partaking in regular physical activities outside of their exercises performed in PT. This was in contrast to participants who were generally more physically active, both in recreation and in PT participation. Participants who reported being more active gave more personalized examples of activities they were able to perform. This is particularly concerning as a SWDs' personal definition of physical activity may greatly influence their self-efficacy of being physically active. If an PWD only perceives physical activity as movements they are physically unable to or have difficulty performing, than it may lead to a belief that physical activity is not possible for them.

As this research is preliminary in nature, further examination is necessary to investigate the influence of personal definitions on activity levels. Educators and rehabilitation specialists may need to introduce PWD to a definition or redefine their current perspectives of physical activity that include adaptive exercises. Thus, emphasizing that even with physical limitations,

individuals can adapt movements and exercise to practice regular physical activity. Previous literature has observed similarly low numbers of PWD who participate in recreational physical activity [11,97,115,199]. However, multiple studies involving interventions of recreational activities with PWD have found participants experience a 'redefining of abilities' [97,115]. Introducing recreational physical activity outside of a therapeutic setting earlier in life may help PWD better identify with their abilities to participate.

The findings from the second theme, Influences to Physical Activity Participation, provided both support of previous literature and new, novel information in relation to university students. In line with previous literature on general population PWD, students reported barriers to physical activity participation were lack of time, lack of interest or motivation, the disability itself, and fatigue [31,83,86]. However, most findings were very unique to the university setting. Although very common in general population PWD, no participants reported accessibility of facilities, lack transportation, costs, or lack of access to information as barriers [31,83,86]. These aspects were encouraging, as they likely indicate that students felt their university was both accessible and adequate in provision of transportation and information services.

It was also promising that a majority of participants (n = 11) regularly used university staff, either a PA, PT, or both, to aid in practice of therapeutic exercises, physical activity, or access to information. However, many students emphasized a lack of regularity in attending sessions or a recognition that they should meet with their PT more often. One proposed cause for a decrease in SWD utilizing disability resources is at the postsecondary level, is the student must take on sole responsibility for themselves. SWD entering the postsecondary level must identify their needs, make accommodation or service requests, and make decisions about academic and disability services [171,200,201]. It is suggested that some students may become

accustomed to depending on adults during adolescence, resulting in difficulty with responsibility, assertiveness, and confidence at the postsecondary level [82]. This lack of independence may result in SWDs' decreased scheduled therapy sessions in comparison to adolescent years. Many factors influence a student's ability to advocate for them self to receive disability services. Particularly, education in self-advocacy, health needs, and available support may benefit students in obtaining services at the university level, as well as post-graduation [171]. Further research should investigate the influence of student's independence on requesting and scheduling rehabilitation services at the university level. Moreover, it is concerning that participants stated PT was their sole form of regular physical activity. As participants reported only going to PT sessions 1-2 times each week, this might indicate they may not be sufficiently physically active for health benefits and management [14,51].

The subtheme of Social Inclusion was particularly interesting, as the literature on social inclusion for PWD continues to grow. In particular at the university setting, SWD have been observed to lack feelings of social inclusion and acceptance by their peers [11,30,77]. In previous literature, SWD report that feeling accepted and belonging to their university was of particular importance, therefore, the results of this study are promising [120]. Almost all of the students (n = 11) reported peers as a facilitator to participating in physical activity. Except for one participant who reported feeling discouraged by a fitness instructor, none of the participants reported feelings of lack of inclusion, social acceptance, or peers as barriers. This may be a result of the inclusive environment the participating university has provided, in which disability accessible dorms and rehabilitation academic programming aim to integrate students with and without disabilities. However, participants not addressing the barriers of social inclusion during the interviews does not completely indicate that they do not exist. Other measures or further in-

depth interviewing specifically addressing peer inclusion and acceptance may better examine these influences [202].

Some limitations of the study should be addressed prior to drawing conclusions. First, the data collected in this study is based off of a relatively small sample of university students, attending at highly accessible campus. These results should be interpreted with caution when applying the information to other campuses, as well as more diverse and broad populations. While the survey measures did help to better describe the sample, more information is needed on similar populations, such as students without disabilities or SWD at other universities, before strong comparisons or generalizations can be made. Finally, our analysis, as with any qualitative study, is subject to researcher bias. In light of this, multiple measures were taken to best address and eliminate bias prior to analysis and drawing conclusions from the data. However, caution should be taken when generalizing the results to other SWD in other environmental contexts.

3.6 Conclusion

In this study, important differences were found on what influences SWD to be physically active in comparison to the general population of non-disabled adults. Conventional definitions of physical activity may deter or detach SWD from participation in physical activity. While living at a university with a long standing tradition towards inclusive policy for SWD, many barriers faced by the general population of PWD are eliminated for SWD. However, even in an accessible environment, SWD still experience barriers to LTPA. Identification of these themes will facilitate further research and help to make effective changes to current universities for improving the lives and experiences of SWD. Further inquiry may help develop strategies at the university level to progress program development and organization to better promote and facilitate physical activity in SWD.

3.7 Acknowledgments

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3.8 Tables

Table 1. Participant demographics

Participant	Gender	Age	University Attendance (# of years)	Disability	Primary Assistive Device*
1	F	39	3	CP	Power
2	Ma	18	1	MD	Power Lift
3	Ma	27	8	MD	Power
4	F	20	1	CP	Power
5	F	18	1	Friedreich's Ataxia	Power
6	F	21	.5	CP	Power
7	F	26	.5	CP	NA
8	Ma	28	5	CP	Power
9	Ma	24	6	MD	Power
10	F	20	1	Scoliosis	Manual
11	F	25	2	Transverse Myelitis	Power
14	Ma	28	4	CP	Power
15	F	22	3	CP	Power
M (SD)		23.69 (5.68)	2.50 (2.33)		

Note: Ma: Male, F: Female, M (SD): Mean (Standard Deviation), CP: Cerebral Palsy, MD: Muscular Dystrophy. Power: Power wheelchair, Manual: Manual wheelchair. *Participants often reported secondary assistive devices

Table 2. Sample Interview Questions

Physical Activity Interview Sample	
Formal Initial	1. To help me better understand, can you tell me how would you describe physical activity? 2. What are the things that prevent you from or help to motivate you to participate in physical activity?
Intermediate	1. How do the resources at the university shape that? 2. Have you utilized any resources that the university provides and how did that affect your physical activity levels?
Ending	1. What is most influential to your participating in physical activity? 2. Do you feel as though you participate in physical activity a healthy amount and can you describe how so?

Table 3. Descriptive statistics for survey variables

	M (SD)	Range	IQR	Median
MOEES				
Physical	25.23 (4.67)	17.00-30.00	9.00	27.00
Social	11.15 (4.16)	4.00-20.00	5.50	12.00
Self-Evaluative	19.85 (3.74)	12.00-25.00	4.50	21.00
EXSE	55.09 (33.09)	0-100.00	61.88	60.00
BARSE	48.28 (21.14)	13.08-82.31	39.23	52.31
SRAHP	89.46 (9.76)	73.00-110.00	14.50	89.00

Note: M: Mean, SD: Standard Deviation, IQR: Interquartile range

Table 4. Results of Spearman's rho correlations analysis on survey variables

	MOEES: Physical	MOEES: Social	MOEES: Self-Evaluative	EXSE	BARSE	SRAHP
MOEES						
Physical	-	-	-	-	-	-
Social	0.88 (0.00)*	-	-	-	-	-
Self-Evaluative	0.74 (0.00)*	0.71 (0.01)*	-	-	-	-
EXSE	0.29 (0.34)	0.39 (0.19)	0.24 (0.43)	-	-	-
BARSE	0.16 (0.61)	0.08 (0.79)	0.34 (0.26)	0.55 (0.05)*	-	-
SRAHP	0.44 (0.13)	0.57 (0.04)*	0.38 (0.20)	0.82 (0.00)*	0.52 (0.07)	-
Age	-0.13 (0.67)	-0.27 (0.38)	0.17 (0.58)	-0.21 (0.48)	-0.00 (0.99)	-0.01 (0.96)
Schooling	-0.30 (0.32)	-0.26 (0.38)	-0.08 (0.78)	0.36 (0.22)	-0.18 (0.55)	-0.02 (0.95)

Note: Correlations between demographic and survey data. All data reported as r_s (*p value*), *denotes significant at $p < 0.05$. Age and Schooling were not tested for correlations. MOEES: Multidimensional Outcomes Expectations for Exercise Scale, EXSE: Exercise Self-Efficacy scale, BARSE: Barriers Specific Self-Efficacy scale, and SRAHP: Self-Rated Abilities for Health Practices Scale

Table 5. Interview codes, themes, and subthemes

Research Question	Primary Themes	Subthemes	Relative Codes Used
What are SWDs' personal perceptions and knowledge of physical activity?	Personal Perceptions of Physical Activity		
		Personal Definitions	Definitions, Knowledge of Physical Activity
		Personal Practices	Personal Practices
What are the primary influences on participation in physical activity that SWDs have?	Influences on Physical Activity Participation		
		University Assistive Resources	University/Staff/Assistance, Physical Resources, Access to Information at University
		Aspects of Personal Wellbeing	Physical and Psychological Benefits, Choice/Self-Regulation, Confidence for Physical Activity Participation
		Symptoms and Physical Limitations	Physical Limitations and Health, Weather
		Time and Scheduling	Academic Classes/Schedules
		Social Inclusion	Peer/Social Influences

CHAPTER 4. INVESTIGATING THE OUTCOMES AND PERCEPTIONS OF AN INCLUSIVE AQUATIC EXERCISE CLASS FOR UNIVERSITY STUDENTS WITH PHYSICAL DISABILITIES

Jennifer Dysterheft, M.S., Gioella Chaparro, M.S., Laura Rice, Ph.D., and Ian Rice., Ph.D.[1]

4.1 Abstract/Overview

The primary purpose of this study was to determine whether university students with physical disabilities (SWD) gained similar benefits from leisure time physical activity (LTPA) participation as able-bodied university students. Using feedback from focus groups, researchers designed a university-offered aquatic exercise class for SWD. Mixed methods were used to examine the outcomes of 5 weeks of participation and experiences of intervention participants. 6 SWD registered for the class and volunteered for participation and 6 inactive SWD volunteered for the control group. Quantitative survey measures examined changes in exercise self-efficacy (ESES), quality of life (WHO QOL-BREF), and social inclusion (SCOPE) for comparison of the intervention and control groups. Qualitative interviews explored the experiences of intervention participants. Independent t-tests revealed no significant differences in pre/post changes between groups, however qualitative interviews contrasted these findings. Thematic analysis of interviews revealed primary themes including SWD Experiences, Initial Perceptions and Future Recommendations, and Outcomes of Participation. Subthemes of these groups indicate participants had numerous positive outcomes and experiences not captures by quantitative survey measures. Results from this study provide important information on participant experiences, outcomes, and recommendations for LTPA for SWD. Recommendations for adapted recreation programing design are made.

[1] Authors have provided permission for dissertation use

4.2 Introduction

In 2011, over 1.1 million university students in the U.S. had a physical disability, effecting nearly 6% of the undergraduate population [12]. It is well studied that physical inactivity levels in the adult population of persons with physical disabilities (PWD) are critically high. Despite the known benefits of physical activity participation, less than 30% of PWD meet the aerobic physical activity recommendations for health and a mere 15% meet resistance training recommendations [13,14]. Unfortunately, current research has demonstrated that the physical activity levels of university students with physical disabilities (SWD) may be reflective of the adult population of PWD [32,42]. While 70-88% of full and part-time university students utilize recreational physical activity services [7-10], less than 30% of SWD regularly used their campus recreation facilities [32].

This is particularly alarming as physical activity is considered one of the most pivotal factors in successful rehabilitation and health management for PWD. PWD who are physically inactive are at an elevated risk of physical deconditioning, which often leads to severe chronic health implications, such as cardiovascular disease and diabetes, overuse injuries, and pain [17,19,22,23,25,65,68]. Exacerbating these conditions, PWD who are physically inactive are also at a heightened risk of secondary physical symptoms, such as osteoporosis, increased spasticity, pressure sores, high blood pressure and obesity [17,56,61,165]. Most alarming, however, are the secondary psychosocial symptoms, including increased risk of anxiety, depression, decreased quality of life, poor activity tolerance, and decreased independence [26,70-73]. Inactive PWD are also more likely to experience feelings of social isolation, lack of acceptance by peers, and negative self-perceptions [30,74-77].

It is well accepted that physical activity participation can counter these negative consequences, as well as provide additional benefits. For university students, participation in leisure time physical activities (LTPA), such as recreational programming and activity courses, has been reported to have profound benefits. Research on LTPA participation in able-bodied university students has observed improvements in students' university adherence, academic performance, peer inclusion, comfort with diverse populations, and healthy lifestyle habits [1,5,11,30,33,34]. Recreational activities have also been found to result in life-long benefits, aiding students in stress reduction, empowerment, and socialization into adulthood and the workforce [11,145]. Unfortunately, little research exists on whether SWD gain the same outcomes from LTPA as their able-bodied peers. Previous research has reported that PWD gain social and confidence benefits with LTPA participation [30,76,77,94,105,203,204]. Additionally, physical activity levels during college and perceived disability levels were two strong predictors of physical activity levels into adulthood [162]. However, the lack of information on SWD is particularly worrisome, as SWD may suffer higher social, personal, and academic consequences if the benefits of LTPA are not obtained due to the physical and social consequences associated with disability [30].

A number of studies have aimed to understand why PWD remain physically inactive, despite the known physical and psychosocial consequences. Research has reported common external environmental barriers to physical activity include a lack of accessible facilities, activities, and equipment, lack of transportation, and high programming costs [31,37,38]. Although the Americans with Disabilities Act (ADA) requires all public facilities and services to be accessible, lack of ADA compliance is still reported as a definitive barrier to LTPA participation for PWD [107,108 37,109]. Additionally, PWD have reported internal personal barriers to physical activity include low self-efficacy and self-regulation, negative self-perceptions, lack of

knowledge, and physical limitations, such as pain and fatigue [35,47,173]. Most commonly, low levels of self-efficacy resulting from negative societal perceptions, lack of experiential opportunities, and low perceptions or misconceptions of ability negatively influence LTPA participation.

Recent studies have found SWD report both similar barriers to those reported by IWD in the general population, as well as barriers unique to the university setting [11,42]. Despite the provision of recreational programming, SWD still reported a lack of accessible activities as a barrier to participation [11]. A study by Devine [11] revealed that SWD participation in recreational physical activities was highly dependent on their capability and interest to perform the activity. However, it was also observed by Dysterheft and colleagues (*see Chapter 3*) that when interviewed, some SWD didn't consider themselves capable of being physically active outside of physical therapy and other daily activities of living [42]. It is postulated that because SWD often have specific needs to perform physical activities, a lack of accessible and appealing activities may contribute to low participation levels and misconceptions of abilities [11,101]. For this reason, it is pertinent for universities to understand the programming wants, experiences, and outcomes of SWD participation in LTPA.

Although numerous studies have examined the benefits and barriers of LTPA in SWD, few have addressed programming implementation of the specific and unique environment of university campuses. When many universities provide disability resource centers and adapted recreation opportunities, it becomes critical to understand why many SWD experience a significant decrease in LTPA levels during their transition from high school into college [43]. Moreso, the lack of SWD presence in university recreation facilities indicates a need to reevaluate SWD wants and experiences in LTPA in order to effectively enhance and design

recreational programs (*see Chapter 5*) [32]. To address these issues, Staeger-Wilson and colleagues recommend universities allow SWD to play significant roles in assisting in the design and development of campus recreation programs [205]. Although little research has been done on adapted recreation planning at the university level, previous research has emphasized that in order for PWD to participate in LTPA programs, the activities must be both satisfying and beneficial to the individual [206]. Maximum benefits of LTPA participation occur when individuals are able to choose their own interests and activities [207].

Therefore, the primary purpose of this study was to design and implement an LTPA course for SWD, based on SWD input, to examine their experiences and outcomes of LTPA. Information from focus groups assisted in the design of a recreational aquatic exercise class. Using a mixed methods analysis, we aimed to examine the experiences and outcomes of SWD participating in a recreational aquatic exercise class to gain a better understanding of adapted programming and design.

Quantitative surveys were used to examine personal outcomes and differences between an intervention and control group. Qualitative interviews were used to compliment the survey data, providing rich, in-depth information on SWD experiences and outcomes. Interviews were focus around two primary research questions: 1) What are the overall experiences of SWD in a recreational aquatic exercise class, and 2) What are SWDs' perceived outcomes from participating in a recreational aquatic exercise class? It was hypothesized that participants in the aquatic exercise class would have significantly greater improvements in exercise self-efficacy, perceived social inclusion, and quality of life (QOL) in comparison to the control group. It was also hypothesized that survey results would be supported by qualitative data collected during the interviews. Information gained from this study may indicate SWD have similar benefits of LTPA

participation, as well as assist universities with adapted recreation program design to improve the university experiences and life-long lifestyle habits of SWD [36].

4.3 Procedures

4.3.1 Study Design

A mixed methods study design was implemented using both previously validated quantitative surveys as well as semi-structured interviews to collect data. Mixed methods allows researchers to use different collection strategies to result in complimentary data and, overall, strengthen the interpretation of the data [176]. Surveys were used to measure pre- and post-intervention psychosocial measures. Interviews were conducted following the intervention period to provide more detailed and in-depth data to expand on survey results and participant experiences during the intervention. Interviews consisted of open-ended questions to allow for individual perspectives and perceptions of the intervention to be expressed. Participants were allowed to expand and freely explain their opinions during the interviews. Interview transcriptions were analyzed using thematic analysis [180,208]. We acknowledge that analysis of qualitative data is subject to researcher interpretation and bias, therefore measures were taken to better recognize the possible bias of each researcher and minimize this bias in the analysis of the data [182].

4.3.2 Participants

The study protocol was approved by the university institutional review board. SWD were recruited for the study from a newly offered, adapted aquatic exercise course offered by the participating university. Participation in the course required that students be currently enrolled at the participating university and identify as a person with a physical disability. After students

registered for the course, the instructor provided them information about voluntary participation in the current study. Students were informed that their choice to participate in the study would not influence their grade or activity in the course. In addition to the course requirements, participants needed to be 18+ years of age. A total of 6 SWD registered for the aquatic exercise course and volunteered to participate in the study. All SWD qualified for participation and completed the study.

For control comparison, undergraduate SWD who were not participating in any activity courses, competitive athletics, or regular recreational physical activity volunteered for the study control group. These participants were recruited from a sample of SWD from multiple universities who were participating in a similar study (*see Chapter 5*). Control participants were required to be university students, identify as an individual with a physical disability, at least 18 years old, and refrain from taking part in recreational physical activities for the 5 week intervention period. A total of 8 participants volunteered for the control group. Of the 8 volunteers, 1 did not refrain from participating in recreational physical activity, and 1 did not complete the post survey measures resulting in a final control sample of 6. For participant demographics, see Table 6.

4.3.3 Intervention Design

4.3.3.1 Focus Groups

Based on results from previous research (*see Chapter 3*.) and recommendations for successful program implementation for SWD, focus groups were held to gain more information from SWD for the design of LTPA intervention [205]. Researchers conducted two, 60 min focus group sessions that were open to SWD at the participating university. A total of 15 SWD

attended the focus groups, consisting of both manual and power wheelchair users, athletes and non-athletes. At the beginning of each focus group session, researchers explained that the primary purpose of the session was to understand what SWD enjoy as LTPA and what LTPA opportunities they would like their university to provide. Researchers used semi-structured interviewing techniques, with initial primary questions and freely developed secondary questions to encourage elaboration of details, such as why specific activities are more appealing to students and what components of recreational programs are necessary for SWD to succeed.

Three primary findings resulted from the focus groups. The first was that unanimously, SWD stated that aquatic exercise was enjoyable and beneficial for therapeutic exercise. Additionally, students with various ranges of physical ability would be able to participate with assistance in the pool, if needed. Second, SWD wanted an opportunity that did not isolate them socially from their peers without disabilities. Finally, ensuring that personal assistances would be provided during the activity was necessary for some SWD to be able to participate. Therefore, an aquatic exercise class was designed to address these findings as a LTPA intervention for the current study.

4.3.3.2 Class Design

The aquatic exercise class was originally designed by the lead researcher and the primary instructor, who was certified in aquatic exercise. The primary goal of the class was to provide a university-offered, recreational exercise opportunity for SWD. At the time the focus groups and design of the class took place, SWD were able to take a 100 level kinesiology course for individual physical therapy participation. However, no other 100 level, recreational physical activity courses were offered specifically for SWD. To the researchers' knowledge, no other

adapted recreational physical activities were offered through the university recreation department, either.

In accordance with information obtained from the focus groups, the aquatic exercise class aimed to promote student independence in exercises, while maintaining social inclusion. To achieve this, the class was designed to allow the SWD participants to exercise in a group setting of their peers. For multiple participants to safely participate in aquatic exercise during the class time, exercise personal assistants (EPAs) were recruited to assist participants perform all aquatic exercises, as well as complete transfers, and clothing changes. Each participant was paired with three EPAs, based on their personal and physical needs.

Peer social inclusion was further emphasized by encouraging undergraduate kinesiology junior and senior students, on a pre-physical therapy or pre-occupational therapy track, to volunteer for EPA positions. Over 20 students volunteered for the EPA positions. Of the 20 students, 17 were able to participate during the class time. Prior to working with participants, EPAs received two weeks of intensive education and training on aquatic exercise, care, transfers, etc. EPAs also received three experiential academic credits in the kinesiology department to participate in the aquatic exercise course and facilitate each participant's exercise program. Under the supervision of the instructor, EPAs conducted all clothing changes, transfers, and aquatic exercises with their participant for each class period. With the permission of the instructor, EPAs were allowed to adjust or make additions to the exercise programs to fit their participant's personal wants or needs.

Prior to beginning the course, the instructor performed initial physical assessments on each participant to determine their capabilities and physical goals. Based on this assessment, the instructor created an individualized exercise program for participants. These programs were

given to the EPAs to carry out with participants. Classes were held twice each week on campus, during the regular spring semester, and lasted 50 min.

4.3.4 Demographic and Quantitative Measures

Data was collected during two sessions: 1) prior to starting the intervention or control period and 2) after 5 weeks of participating in the intervention or the control period. Due to some participants beginning the course at later dates, post-intervention measures were taken at five weeks to ensure equal intervention time for all participants. The first session consisted of participants completing pre-intervention measures. These measures included a demographic information form and multiple, reliable and validated survey tools examining current leisure time physical activity (LTPA) levels, perceived quality of life (QOL), exercise self-efficacy, and social inclusion. These survey tools were repeated during the second session.

4.3.4.1 Survey Measures

The Leisure Time Physical Activity Questionnaire for People with Spinal Cord Injury (LTPAQ-SCI) Participation in LTPA was used to measure LTPA levels of participants [209]. The 6-item scale is a validated and reliable self-report measure developed for individuals with spinal cord injury and easily translates for individuals with other physical disabilities [209]. The questionnaire assesses the number of minutes of mild, moderate, and heavy intensity LTPA a participant performed over the seven days prior to testing. In order to gain more specific information for this study, three short answer questions were added to each category of intensity. These short answer questions addressed the type of LTPA performed, the location or facility in which LTPA were performed, and the equipment or resources used to perform the LTPA. Additionally, two questions were added to the end of the survey pertaining to long-term use of

their campus recreation facility (*see Appendix for LTPAQ-SCI)*. LTPAQ-SCI scores were reported as cumulative values using the Godin LTPA equation [210].

To measure perceived QOL, participants completed the WHO Quality of Life-BREF [211,212]. The WHO QOL-BREF has been found to be a valid and reliable with multiple populations of PWD. The WHO QOL-BREF, shortened version of the WHO QOL 100, consisting of 26 items that measure domains of Physical Health (seven items), Psychological Health (six items), Social Relationships (three items), and Environment (eight items) [211,213]. The last two items measured overall perceived QOL and general health. Items are rated on a 5-pt Likert scale to determine raw item scores. Mean scores for each domain are used to calculate the final domain scores, ranging between 4-100. Higher scores indicated a greater perceived QOL of participants for the domains. For this study, the domains will be reported as QOL Physical Health, QOL Psychological Health, QOL Social Relationships, and QOL Environmental Health (*see Appendix for WHO QOL-BREF*).

Exercise specific self-efficacy was measured using the SCI Specific Exercise Self-Efficacy Scale (ESES) [53]. The ESES is a valid and reliable, 10-item scale measuring a PWD's confidence in performing physical activity and exercise [214]. Each item is rated on a 4-pt Likert scale and results are summed to produce a final score ranging from 10-40. Higher scores indicate a greater perceived exercise self-efficacy (*see Appendix for the ESES*).

To measure perceived social inclusion and opportunities the Social and Community Opportunities Profile – Shortened Version (SCOPE) was used [215]. The SCOPE is comprised of 9 domains to measure perceived social opportunities and inclusion: Leisure and Participation, Housing and Accommodation, Safety, Work – Employed, Work – Unemployed, Financial, Health, and Family and Social. Due to the extensive length and broad coverage of the SCOPE,

only two domains, the Leisure and Participation and Family and Social, were used for this study. This shortened the measure from 48-items to 15. These domains of the SCOPE can be scored and summed, resulting in values for number of perceived opportunities and ratings of overall feelings of inclusion. Prior to taking the SCOPE, participants were informed their answers should be based on their perceptions of the campus community, not the larger city community. Higher values indicate more perceived opportunities and levels of inclusion. For descriptive analysis, the perceived Opportunities for LTPA and Opportunities for Inclusion domains will be scored and reported individually (*see Appendix for SCOPE measures*).

4.3.5 Qualitative Measures

During the second data collection session, once the post-intervention survey measures were completed, individual interviews were conducted. Interviews took place in quite, private locations, based on participant preference. As interviews were aimed to understand participant experiences, control group participants were not interviewed. Semi-structured, open-ended questions were used to capture the rich, personal expectations and experiences of participants beyond what surveys may be able to provide. Data from these interviews were used to compliment survey results, as well as provide in-depth information for deeper analysis and interpretation. Interviews were conducted by the lead researcher, who was not involved in the administration or instruction of the course to remove bias. Ten formal interview questions were developed prior to data collection using structured questions from previous literature [87,115]. These questions were modified to address participant experiences in the aquatic exercise course and outcomes resulting from the course (*see Appendix for all questions*). The lead researcher used intensive interview strategies and freely developed secondary questions to help direct conversation and encourage participant elaboration. This aided in participants providing greater

insight to experiences, perceptions, and outcomes of the aquatic exercise class. At the end of the interview, participants were given the opportunity to provide any additional thoughts or comments about their experiences with the course.

Interviews lasted an average of 28 minutes. All participant interviews were audio recorded using a digital voice recorder (Apple Voice Memo; iPhone 6, Apple Inc., Cupertino, CA, USA). Following the interviews, audio recordings were transcribed verbatim and then reviewed for accuracy by the interviewing researcher. Participants were provided the opportunity to anonymously share their comments and recommendations with the instructor to improve the course for the remainder of the course.

4.3.6 Data Analysis

4.3.6.1 Quantitative Analysis

Analysis of demographic and survey data was performed using IBM SPSS Statistics Version 22 (SPSS, Inc., Chicago, IL). Prior to analysis of pre-intervention and post-intervention survey scores, all data was analyzed for violations of normality, outliers, and errors. A Shapiro-Wilk test was used to test for normality of data distribution. Histograms and Q-Q plots were used to determine outliers. Demographic and survey data were analyzed for descriptive statistics. Based on normality of data distribution, Independent T-Tests were used to compare changes in WHO QOL-BREF domains, ESES, and SCOPE domain pre- and post- intervention scores between groups. A Mann-Whitney U test was used to compare changes in the LTPAQ-SCI pre- and post-intervention scores between groups. Due to running multiple t-tests, a Bonferroni correction was used to set statistical significance at $p \leq 0.01$. Descriptive statistics are reported as mean (M) ± standard deviation (SD).

4.3.6.2 Qualitative Analysis

To analyze the data from participant interviews, two researchers first read over three transcriptions and identified, analyzed, and interpreted primary themes found in the data [180]. The researchers used line-by-line, open coding strategies to develop primary themes found in the data until no additional novel themes were found [208]. For further examination, researchers re-read the transcriptions and developed subthemes within each primary theme. Researchers then compared results of preliminary analysis to identify commonalities and discrepancies. Once the researchers came to a consensus of the recurring themes and patterns relating to the original research questions, a final codebook was developed. A third researcher was trained and all transcriptions were coded, by all three researchers, according to the final codebook. Each of the final coded transcriptions were checked for consistency. Additionally, an auditor, who did not take part in the data collection process, was used to review all primary and subthemes, as well as coding. The auditor helped to examine transcription codes for bias and discrepancies, as well as address any data concerns [180,186]. Any discrepancies that occurred were discussed and a general consensus was reached [180,186].

Multiple methods were used to ensure credibility and transferability of the results during analysis. First, standardized, pre-structured interview questions were used during all interviews to maintain reliability of data collection. Questions were open-ended to allow participants to discuss their personal experiences. Additionally, the interviewing researcher was not affiliated with the instruction of the course to allow for open discussion with participants. Second, interview data was triangulated with survey results and demographic data. Finally, the auditor aided in searching for negative cases, or outliers, to determine if any participants or data were not consistent with the emerging themes.

While measures were carried out to ensure the credibility and transferability of the data, it is advised that readers use caution when generalizing the results of this study. These results may differ in other environmental contexts and with other populations as this intervention was performed at a university recognized for its disability services and efforts to be a disability-friendly campus. Although, there is no perfect separation of the researchers from the participants [190], researchers aimed to address and minimize all bias during the analysis of data. None of the researchers had direct, prior relationship with the participants or professional obligations that would have led to the coerced participation in this research study.

4.4 Results

All descriptive statistics of the intervention and control groups are reported in Table 6. Due to the nature of the data, quantitative and qualitative results will be reported in an integrated structure. The first subsection (4.4.1) will contain survey results, followed by corresponding interview data that supports or contrasts findings.

The second subsection (4.4.2) will include the remainder of the qualitative results. Results of the Shapiro-Wilk test indicated that all variables, except the LTPAQ-SCI ($p < 0.01$) had normal distributions. No outliers were removed from the dataset. Descriptive measures and results of the surveys are reported in Table 7. Results of the Mann-Whitney U test indicated significant differences between groups for LTPAQ-SCI pre- and post-intervention changes ($U = 2.00$, $z = -2.58$, $p = 0.01$). The control group did not show increases in LTPA from pre- to post-intervention.

4.4.1 Quantitative and Corresponding Qualitative Results

Results of the QOL Physical Health domain indicated that no significant differences occurred in pre- and post-intervention scores between groups (Table 7). Both the intervention and control groups had Physical Health domain scores similar to those found in previous studies on PWD [92,104]. The intervention group had a mean decrease in the Physical Health domain of 2.0 points (Pre: 71.00; Post: 69.00) (*see Table 7*). In contrast, data collected from participant interviews indicated participants perceived improvements in physical health, specifically facets included in the Physical Health domain of the WHO QOL-BREF, such as sleep quality, mobility, energy, and capacity [211]. All participants in the intervention group stated they perceived positive physical outcomes resulting from the aquatic exercise class (*see Theme 3: Outcomes of Participation section*). Participant stated participating in the aquatic exercise class gave them more energy, helped them sleep better, and improved muscular strength, flexibility, muscular endurance, and mobility. For example, one participant with cerebral palsy stated that as a result of the aquatic exercise, "I'm just really happy because…I've gotten to do stuff that I honestly never thought I could do." She expanded on this by explaining her improvements in walking up stairs and in a straighter line. Similarly, another student explained, "we're only half-way through the semester and I've gotten so much better with certain [exercises] so…it just makes me feel like…I can basically learn to do anything, given the right people".

Results of the QOL Psychological Health domain surveys also indicated no significant differences in pre- and post-changes between groups (Table 7). The intervention group had higher Psychological Health domain scores, whereas the control group had similar scores to those previously reported for PWD in the literature [92,104]. The intervention group showed a small, but non-significant increase in mean QOL Psychological Health domain scores (Pre: 80.33; Post: 82.50). Data collected from the interviews supported this increase, as all participants

reported positive outcomes in facets of the Psychological Health Domain, including self-esteem, learning, thinking, and positive feelings (*see Outcomes of Participation section*) [211]. Of the six participants, four stated they felt a sense of accomplishment and all six stated having positive feelings as an outcome of the aquatic exercise class. Participants stated participating in the class gave them confidence to complete other exercises and activities. For example, when asked how the class affected her physical abilities, a participant responded,

> I think it's changed a lot. Especially because I know how far I can push my body...now that I've actually pushed it to the limits…it's helped translate into giving [me] confidence in regular therapy too, because…it's like, if I can do this in the water, I can do this here.

Similarly, multiple participants explained they felt more willing to try new things, knowledgeable about their own abilities and exercises to improve their health, and confident in overcoming tasks. One participant, who was also a competitive wheelchair racer, explained,

> So of course I'm not like experienced in swimming, but it's nice to see that growth… I guess you can translate that to my life because I feel better about myself when I get out of class…that's nice for me to have something mentally that I'm excited for because wheelchair racing can be so competitive, it's nice to have that builder-upper.

No significant differences were found between groups for pre- and post-changes in QOL Social Relationships domain survey results (Table 7). Both groups had similar scores to those previously found in the literature of PWD [92,104]. The intervention group did have a moderate, but not significant, increase from pre- to post-intervention (Pre: 59.33; Post: 73.00). Data from the interviews supported this increase with all participants reporting positive social outcomes, such as improved personal relationships and social support (facets of the Social Relationships

domain). Although some participants reported having a large peer network prior to participating in the intervention, thus less social outcomes of the class, all participants reported positive social relationships with their assigned EPAs. Most participants recognized the role of the EPAs was to assist, however as one participant explained,

> For me it's like, yes, they are 'working for me' or helping me do whatever I need to do…but they're also, like we get to know each other and I can guarantee you the three of us will be friends after they graduate, guarantee you.

Another participant expanded on this by stating the EPAs being undergraduates, "makes them easier to talk to because, you know, while you're lying there stretching you can talk about 'hey did you see this happen on campus this weekend' or things like that". Most participants described the EPAs as relatable, which helped them to build a personal connection with their EPAs and made the class more relaxing. Additionally, three of the six participants stated the aquatic exercise class helped them to build social connections with the other participants, as it served as a common factor between them. For example, one participant stated that although the participants often did not interact during the class,

> It is nice walking around campus and seeing some of the other students in the class and you do acknowledge them and that's nice to see, you know, someone who isn't in track, but also has a physical inconvenience that you can like walk by and say hello to.

No significant differences between group changes were found for QOL Environmental Health domain (Table 7). Following the intervention period, the control group had similar scores, but the intervention group had higher scores in comparison to those found for PWD in previous literature [92,104]. A small, but non-significant increase in QOL Environmental Health

domain scores was observed for the intervention group (Pre: 81.33; Post: 85.67). No themes were found in the interview data that corresponded to the facets of the QOL Environmental Health domain to support or refute these changes.

No significant differences were found scores between groups for changes in ESES scores from pre- to post-intervention (Table 7). Both groups had similar scores to those previously reported in the literature for PWD, with the intervention group having moderately, but not significantly higher ESES scores than the control group [216-218]. The intervention group mean decreased slightly following the intervention (Pre: 33.33; Post: 32.50). In contrast, data from the interviews revealed nearly all participants (n = 5) reported feeling more confident and likely to attempt new exercises or activities as an outcome of participation in the aquatic exercise class. Similar to the results reported for the Psychological Health domain, participants reported feeling less intimidated by new exercises or movements, more motivated to try new activities, and more confident in their ability to perform various movements or exercises. One participant explained that with her gains in strength,

> I'm more willing to like try different stuff…because like, I was really nervous to do the stairs the first time because I thought I would fall backwards, which thankfully I didn't, but now I'm less scared to try to do new stuff.

Additionally, participants discussed feeling more confident as a result of the knowledge they gained from their participation. For example, one participant stated as a result of the class, "I know more about myself…I know more of my strengths and weaknesses". She expanded on this by explaining, "Well it's like, people can go to the gym and they know what amount of dumbbells to lift…1) I don't do that and 2) I wouldn't know, so I think [aquatic exercise] is like my workout and how I determine [what to do]".

Results of the SCOPE revealed no significant differences in pre- and post-intervention changes between groups for the Perceived Opportunities for LTPA and Perception of Inclusion domains (Table 7). Post-intervention group results of the SCOPE are as follows: 5 control participants and 6 intervention participants agreed there were leisure, sports, or entertainment facilities on their campus. Only 1 of the control participants reported using these facilities, while 5 intervention participants reported use of them. On a rated scale from 1-7 (1 = Terrible, 7 = Delighted) about how participants felt about their opportunities for leisure on their campus, the control group reported a mean score of 4.16 ± 0.75 and the intervention group reported a mean score of 5.00 ± 1.09. In a short answer response option to describe what they would like to change about their leisure opportunities on campus, participants reported a need for increases in accessible sports, activities, equipment, assistance, and facilities. Participants also placed emphasis on a need for more leisure based activities over competitive sports. When asked about the availability and range of opportunities to be involved with their campus, control participants reported mean scores of 5.50 ± 0.84 and 4.5 ± 0.84, respectively. Intervention participants reported mean scores of 3.50 ± 1.52 and 5.33 ± 1.50, respectively. Lastly, when asked to what extent they felt included within their campus community, control participants reported a mean score of 4.00 ± 1.60 and intervention participants reported a mean score of 5.50 ± 1.04.

4.4.2 Qualitative Results

Analysis of the interview transcriptions resulted in three primary themes and eight subthemes based on 19 codes. Research questions, primary themes, subthemes, and corresponding codes are reported in Figure 1. Based on the research question, What are the overall experiences of SWD participating in a recreational aquatic exercise class?, the primary themes of Initial Perceptions & Future Recommendations and SWD Experiences were found.

From the research question, What are SWDs' perceived outcomes from participating in a recreational aquatic exercise class?, the primary theme of Outcomes of Participation was found.

4.4.2.1 Theme 1: Initial Perceptions & Future Recommendations

During the interviews, participants were asked to describe and elaborate on their experiences during the aquatic exercise class. On their own accord, many participants described initial perceptions or expectations prior to beginning the class, as well as recommendations for the design of future programs. These underlying themes created the two subthemes of Motivations & Anticipated Experiences and Recommendations.

In the subtheme, Motivations & Anticipated Experiences, participants expressed their reasoning for registering for the aquatic exercise class. Three of the six intervention participants had participated in aquatic exercise or therapy previously and stated this as a reasoning for participation. The other three participants stated they had heard previously of the benefits of aquatic exercise and were interested. All of the participants explained that exercise for health and symptom management was a primary motivator for participation in the class. Examples of participant reasoning for participation included muscle maintenance, increased energy, increased flexibility, lung functioning, and continuing progress from rehabilitation. Two of the participants also stated athletic training and conditioning for a competitive sport was an additional reason.

The subtheme, Motivations & Anticipated Experiences, also included participants' explanations of their initial expectations for the class. As stated by participants, based on their previous experiences with adapted exercise classes, their expectations for rigor of exercises, knowledge of EPAs, and organization of the course was very low. When asked to elaborate on her expectations of the rigor of the class, one participant explained, "I get pushed really hard

[during class]. Like honestly…not to offend you, but I didn't think it was going to be this detail oriented, I thought it was going to be kind of kicking and floating." Another participant described his anticipations for the EPAs by stating, "[The EPAs] are nice, they know what they're doing. They're not stupid, I was kind of worried they might be…" When asked to explain why, he continued, "Well, because it's a brand new class, so I figured [the instructor] might end up winging it a little bit, so I might get some people who don't know what they're doing." Many of the participants expressed having these initial concerns for the class. Additionally, five of the six participants explained that friendly, knowledgeable EPAs are significant to their enjoyment of the program. As one participant explained,

> The biggest thing is making friends with the people that help me and honestly like, when people have to change you in and out of a bathing suit, it'd be kind of awkward if you couldn't have a conversation, so like that's really nice.

Most participants elaborated on this, stating that feeling comfortable with their EPAs was critical.

In the second subtheme, Recommendations, participants described aspects of equipment, class organization, safety measures, and EPAs that they felt were positive, as well as what could be done to improve future programming. Most participants (n = 4) reported a need for additional equipment, such as multiple chair lifts, to prevent waiting for use. This equipment included chair lifts, water wheelchairs, water weights, and water dumbbells. In contrast, most participants (n = 5) reported that having three EPAs seemed to be too many for the amount of assistance needed. Three of these participants did suggest that three many be necessary in case of EPA absences or cancelations. Two of the participants recommended that participants meet the EPAs prior to beginning the class to review personal preferences. Five of the participants stated having

undergraduates as EPAs was preferred to older graduate students or adults and should be maintained in future classes. Although one student stated that she and her undergraduate EPAs lose focus at times when in conversation, all participants stated undergraduates were more relatable. Participants also stated that having EPAs 'their own age' made them easier to talk to and the classes more relaxed. Additionally, all participants stated that having undergraduate students interested in physical or occupational therapy was beneficial. One participant described the importance of EPA interested in healthcare fields,

> That's a big thing…finding the right people who want to be with people with physical inconveniences and want to learn more about that because, as much as they can offer to much, I feel like we can offer the same to them.

Four of the participants stated they would like to have more independence during the activities, however, due to safety regulations they understood it was not always possible.

4.4.2.2 Theme 2: SWD Experiences

Many participants described their overall experiences while participating in the aquatic exercise class. The descriptions of these experiences created the two subthemes of Experiences during the Class: Positive & Negative and Class Continuation.

The first subtheme, Experiences during the Class: Positive & Negative, included participant reflections on their experiences with the exercise programs, their EPAs, and their experiences in the water. All participants reported positive experiences in the water. Participants with higher mobility limitations due to their disability stated that the water enabled them to move more freely, with less resistance. One participant described being in the water as, "I'm happy I can like move in ways that I normally can't move." Another participant explained,

> I guess it is just different for us because we can do so much more in the water…I feel like I'm doing more of the exercises on my own, by myself, but like at therapy, normally someone is doing [the exercises] to me.

Similarly, other participants explained in the water they felt relaxed and free to move.

All of the participants also reported having positive experiences with their EPAs, citing their undergraduate status, interest in therapy, and knowledge as primary reasons. All of the participants also reported enjoying their EPAs and stated having positive connections with them. At the same time, three participants also reported having negative experiences with certain EPAs, two reporting that themselves and their EPAs got distracted at times from conversation and one participant reporting that she had an EPA who was not engaged in the class. All participants stated they had positive experiences with the exercises provided to them, with two of the participants recommending more individualized exercises.

The second subtheme, Class Continuation, consisted of participant statements of whether they would continue the class if it were provided the following semester. All of the participants stated they would like to continue the class. Additionally, multiple participants requested it be offered multiple semesters for further continuation.

4.4.2.3 Theme 3: Outcomes of Participation

The last theme included a statement describing the perceived outcomes they gained from participating in the aquatic exercise class. The descriptions of these outcomes constructed the last four subthemes of Physical Benefits, Psychological Benefits, Social Benefits, and Academic Credit.

The subtheme of Physical Benefits included participant statements of positive physical outcomes they received from participating in the class. All participants reported physical benefits. These statements are outlined in more detail in the Quantitative and Corresponding Qualitative Results section of this paper (section 4.4.1), following the results of the QOL Physical Health domain.

The subtheme of Psychological Benefits included participant statements of positive psychological outcomes they received from participating in the class, including stress reduction, improved self-awareness and confidence, feelings of accomplishment, and knowledge. All participants reported psychological benefits as a result of participation in the class. These statements are outlined in more detail in the Quantitative and Corresponding Qualitative Results section of this paper, following the results of the QOL Psychological Health domain (section 4.4.1).

The subtheme of Social Benefits included participant statements of positive social or peer outcomes they received from participating in the class. Examples of these outcomes included participants stating they gained friendships, felt peer connections, or gained peer relationships outside of the class. Four of the participants reported gaining peer benefits, either inside or outside of the class. These statements are outlined in more detail in the Quantitative and Corresponding Qualitative Results section of this paper, following the results of the QOL Social Health domain (section 4.4.1).

The final subtheme of Academic Credit included participant statements of the importance of receiving academic course credit for participation in the class. As one participant explained,

> This is going to sound strange, but the ability for us to receive the academic credit for this goes a long way because there's a lot of my friends that take like ice skating and, you know, all of the random [kinesiology] one credit [activity] classes when they need them as seniors and this is kind of my equivalent for that.

The same participant expanded on this by stating,

> How many [kinesiology activity] classes are there for one credit for the average student? And [SWD] have two, we have [physical therapy] and then this. If you can open that up and like, some people can't swim, maybe they have like a feeding tube or something and they can't swim, but if there were another sport they could do then they could have the same benefits of, "hey, look what I learned to do"

All of the participants made recommendations for future class, emphasizing the want for growth in an adapted recreation program and inclusive kinesiology activity classes.

4.5 Discussion

As the literature examining what influences SWD to participate in LTPA grows, so does the need to understand their wants and experiences in LTPA, to better develop appealing and effective adapted recreation programming. Using mixed methods, we were able to examine participant's personal outcomes, including LTPA levels, exercise self-efficacy, perceived social inclusion, and quality of life (QOL) and compare outcomes to an inactive, control group. Complementing the survey data, interviews were used to examine two primary research questions: 1) What are the overall experiences of SWD in a recreational aquatic exercise class and 2) What are SWDs' perceived outcomes from participating in a recreational aquatic exercise class? This study adds to the literature, aimed at understanding the experiences and outcomes of

SWD. Most importantly, we also found valuable SWD perceptions of adapted programming and recommendations for future design.

Our first hypothesis was not completely supported, as no significant differences occurred between the intervention and control group for pre- and post-measures, except LTPA (Table 7). The intervention group reported significantly greater increases in LTPA levels that then control group over the 5 week intervention period (Table 7). This was, in part, due to the addition of the aquatic exercise class participation, but also, as reflected in interviews, participants reported feeling more confident in trying new exercises and activities. Future studies may use actigraphy to compliment these measures and examine other possible types of physical activity that improve, such as independent activities of daily living.

While the intervention group did show large increases in LTPA level following the intervention, no other personal outcomes from the WHO QOL-BREF domains, ESES, or SCOPE domains surveys significantly improved. However, information from the interviews directly contradicted these results. This conflict may indicate that the survey measures chosen used were not sensitive enough to capture changes following the intervention. This may also be the result of the small sample population and large standard deviation of the sample data. Future research should investigate interventions with larger sample populations, more sensitive survey measures, or the development of a mixed methods survey to better analyze the outcomes and effectiveness of adapted recreation programming for SWD.

Despite the lack of significant changes in survey measures, information collected from participant interviews support that SWD may have similar, yet still very unique, experiences and benefits of LTPA participation as their able-bodied peers. Much like able-bodied university students, participants reported having positive social outcomes from the class. However, unique

to the participants, these social outcomes were primarily results of building relationships with their EPAs and less with other participants in the class. Although not stated by participants, the comfort and development of relationships with their able-bodied peers may assist in reducing feelings of social isolation, resulting from social stigma of disability [102,219,220]. Also similar to able-bodied university students, participants described improvements in stress reduction, confidence to complete exercises, and willingness to try new exercises and activities. Unlike their able-bodied peers, much of the confidence to complete new exercises transferred into therapeutic exercise or activities of daily living settings. Although LTPA opportunities are still limited at the university level for SWD, this confidence may also transfer into greater levels of independence, as well as activities outside of therapy and daily living, such as new LTPA and programs. These results are in line with those of previous studies on PWD [30,94,203,204]. Further research should examine additional positive outcomes of LTPA participation, such as possible academic benefits, including adherence and performance in academic programs, as well as long term benefits, including future LTPA participation and socialization into adulthood [5,34,145].

Specific outcomes very unique to SWD were also found. First, multiple participants emphasized they gained knowledge and self-awareness with exercise as a result of participation in the aquatic exercise class. Although findings of improved health and interest in exercise have been found for able-bodied university students [5], these particular benefits may be much more critical for SWD. Interviews from a previous study show some SWD do not associate with exercise, or perceive themselves as unable to exercise [42]. Similarly, previous research has found that PWD perceive their disability to injury to be a major barrier to exercise [31,90,220]. Participation in an LTPA course may assist in promoting a perception in SWD that they are able to exercise. As observed in participants from this study, LTPA participation may also inform SWD how to

exercise and what they are capable of doing. Secondly, it was particularly interesting that participants emphasized earning academic credit as a positive outcome. This may indicate that SWD would be more likely to participate in LTPA if they were able to obtain academic credit, increasing the likelihood of achieving the observed positive outcomes. Universities should take this into consideration, as it may affect the participation rates and success of adapted recreation programs.

Perhaps the most important information gained from this study were the participant expectations for the class and their recommendations for future programming. Alarmingly, most participants reported low expectations for the class design, rigor of exercise programming, and knowledge or dedication of the EPAs. Participants explained these expectations were based on previous experiences, which may give indication of a major barrier to LTPA participation, previously unknown. Past studies have revealed that appeal of activities, degree of difficulty, and personal assistants/instructors are influential to both PWD and SWD physical activity levels [31,42]. Future research should focus on examining the extent to which negative previous experiences with adapted recreation programming acts as a barrier to PWD.

Additionally, participants made recommendations on equipment and EPAs. Participants recommended that enough equipment be available to prevent waiting or sharing or materials. This is in line with previous studies, in which lack of equipment was reported as a barrier to participation [31,101,220]. Based on the positive experiences with EPAs, many participants suggested that for future programming, EPA remain undergraduate students with career goals in physical and occupational therapy. Participants emphasized that they felt EPAs were more relatable, as well as dedicated to the class when these criteria were met. It was also suggested that EPAs and participants met prior to the start of exercises to allow participants to explain personal

preferences and abilities to their EPAs. This likely may help SWD build trust with their EPAs prior to beginning an exercise program. It should be noted, during the focus groups and contact with the lead instructor, participants stated the necessity for EPAs to be provided by the class for participation. Although the participating university provided personal assistants for students, specific activities and locations are not included in that provision. Therefore, participants would have had to hire personal assistants specifically for the class. This was particularly interesting, as it may also indicate a previously unknown barrier to LTPA participation.

Based on this information, when designing adapted recreational programs for SWD, universities need to be mindful of multiple components. To ensure effective design and program implementation, universities should use programming strategies, such as Benefits Based Programing (BBP) [221]. Originally developed to address social issues, BBP has been used to focus on the outcomes gained by those who participate in recreational opportunities [221]. The four step process of BBP can help universities 1) clearly identify the current major issues in their recreation program, 2) determine what activities or programs they can offer to SWD and what activities SWD want, 3) review the activities and programs after implementation to determine if they are meeting goals set by SWD and the recreation program, and then 4) bring awareness to the successes or needs of the program [221].

According to the first two steps of BBP and recommendations from previous research, universities should be aware of what activities SWD want [205,221,222]. SWD should be included on committees and panels to help with the design and renovation of programs [205]. By providing SWD with input and the ability to help choose available programming, the university can maximize benefits SWD gain from participation and ensure cost-effective program planning [207]. SWD opinions may also provide insight to necessary equipment or issues with facility

accessibility. The average university spends just under $50,000 annually on recreational sporting equipment alone, however often fail to allocate funds to specifically enhance inclusive opportunities for SWD [158]. In order for universities to build successful programs, these programming aspects need to be addressed. It should be noted for this study, multiple focus groups were held to ensure we addressed the population of SWD at the participating university. While aquatic exercise has been found to be popular and beneficial for PWD, it may not be successful at every university [223,224].

Findings from this study should also be considered during the program planning process. Universities should ensure that instructors and personal assistants can modify activities for multiple levels of ability. As stated by participants in this study, some adapted programming may not challenge SWD, thus undermining physical abilities or prevent participation [11]. Moreso, instructors should be knowledgeable of adaptions to exercises, as well as social constructs of disability. Previous studies have observed that a perceived lack of knowledge of instructors/assistants, and negative perceptions or attitudes towards SWD can act as a significant barriers to LTPA participation [31,74,102]. By providing personalized or adaptable programming in a welcoming environment, instructors and personal assistants can challenge SWD, yet not discourage them. It is also recommended that all programs provide sufficient assistants for SWD to prevent the need for external provision of personal assistance.

Finally, once the design and implementation of the program has occurred, universities should review the programs to determine if they are meeting the expectations and goals of SWD, and then bring awareness to the successes or needs of the program [22]. Review of the programs should include meetings will include students with and without disabilities' who have participated in the programs, as well as recreation staff [3]. Although the long-term effects of

recreational activities may not be measured early after the onset of these programs, attendance and participation numbers, concerns, or suggestions, as well as costs, should be evaluated. This evaluation, in turn, will help to design future improvements in the programming for SWD.

4.6 Limitations

Prior to drawing conclusions, some limitations of the study should be address. First, the data collected in this study is from a relatively small sample of SWD who voluntarily registered for the aquatic exercise class. Next, the study took place at a highly accessible university, with a reputation for its dedication to inclusiveness of PWD. This dedication and the cooperation of the university kinesiology department and campus recreation allowed the intervention to be provided as a 100 level kinesiology course. Therefore, these results should be interpreted with caution and the acknowledgement that they may not apply to more diverse campuses and populations. Also, it should be noted that although the quantitative measures used failed to sufficiently denote changes from pre- to post-intervention, they may be effective in larger sample populations or following longer intervention periods. Finally, as with any qualitative study, analysis subject to researcher bias. While multiple measures were used to minimize any bias during data collection, analysis, and interpretation, caution is recommended when generalizing results to other populations and environments.

4.7 Conclusion

This study was the first to examine the experiences and outcomes of SWD participating in an aquatic exercise course. Important, novel information on participant experiences, outcomes, and recommendations was gained. Recommendations for adapted recreation programing design are included.

4.8 Tables and Figures

Table 6. Intervention and control group demographics

	Intervention	Control
n	6	6
Age (years)	20.0 (1.26)	21.83 (2.48)
Gender	M = 1 (17%)	M = 4 (67%)
Years at University	1.42 (1.16)	2.75 (1.94)
Enrollment	Full = 6 (100%)	Full = 6 (100%)
Years since Injury/Diagnosis	20.0 (2.0)	12.67 (9.73)
Disability Types	CP (3), MD, SMA, PFFD	Arthro (2), FD, NN, RA, SMA

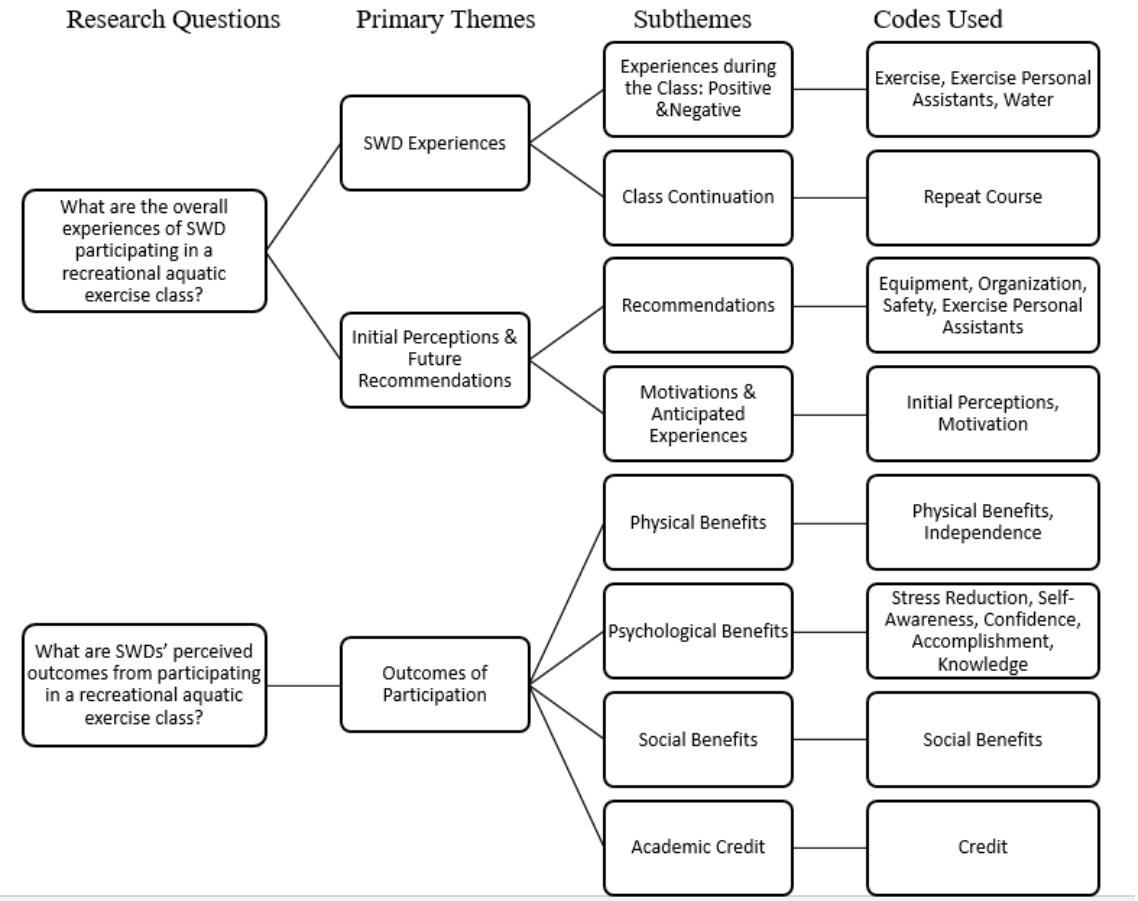
Note: M: Males; CP: Cerebral Palsy, MD: Muscular Dystrophy, SMA: Spinal Muscular Atrophy, PFFD: Proximal Femoral Focal Deficiency, Arthro: Arthrogryposis, FD: Fibrous Dysplasia, RA: Rheumatoid Arthritis, and NN: Nerve Neuralgia

Table 7. Survey outcome measures

	Group				
	Control		Intervention		Change Comparison
	Pre M (SD)	Post M (SD)	Pre M (SD)	Post M (SD)	t-score (*p*)
Godin LTPA	13.66 (25.97)	10.17 (11.41)	16.17 (19.89)	40.83 (23.25)	2.00 (0.01)*
QOL Physical	62.50 (13.07)	62.83 (12.40)	71.00 (8.20)	69.00 (17.41)	-0.33 (0.75)
QOL Psychological	62.50 (13.07)	57.33 (18.74)	80.33 (12.40)	82.50 (7.45)	1.35 (0.21)
QOL Social	58.33 (31.71)	57.33 (31.33)	59.33 (17.24)	73.00 (19.74)	1.48 (0.17)
QOL Environmental	68.83 (14.87)	66.00 (23.63)	81.33 (10.52)	85.67 (8.69)	0.81 (0.44)
ESES	28.83 (3.25)	28.17 (3.54)	33.33 (3.56)	32.50 (4.85)	-0.96 (0.93)
SCOPE: Opportunities for LTPA	8.67 (1.37)	8.67 (1.21)	9.33 (2.07)	9.50 (1.64)	0.14 (0.89)
SCOPE: Opportunities for Inclusion	18.00 (5.40)	19.33 (5.61)	17.17 (2.79)	17.67 (3.33)	-0.28 (0.79)

Note: LTPA: Leisure time physical activity, QOL: Quality of life, ESES: Exercise self-efficacy score; M: Mean, SD: Standard deviation. Independent t-test used to compare pre- to post-intervention outcome changes between groups. *denotes statistical significance

Figure 1. Qualitative interview results



CHAPTER 5: DETERMINANTS OF LEISURE TIME PHYSICAL ACTIVITY PARTICIPATION IN UNIVERSITY STUDENTS WITH PHYSICAL DISABILITIES: A MULTI-UNIVERSITY STUDY

5.1 Abstract/Overview

The purpose of this study was to investigate the participation rates and determinants of leisure time physical activity (LTPA) participation of university students with physical disabilities. 40 SWD from 16 U.S. universities completed a mixed methods online survey regarding their LTPA practices and influences to participation on their campus. Reliable and validated surveys used to measure variables of interest included LTPAQ-SCI and PASIPD (physical activity), WHO QOL-BREF (quality of life), ESES (exercise self-efficacy), SCOPE (social inclusion opportunities), B-PEDS (barriers to exercise), and Self-Regulation questions (intent to exercise). Short answer questions were included to allow participants to expand on answers and provide more detailed information. Kruskal-Wallis tests were used to examine differences in survey outcomes between gender and sport participation. Spearman's rho and multiple regressions analysis were used to examine the extent of the relationships between variables of interest and participant physical activity levels. Short answer responses were analyzed using thematic analysis strategies. Quantitative analysis revealed a strong correlation between the PASIPD and LTPAQ-SCI scores, and significant correlations between all variables of interest and PASIPD scores. Variables found to have the strongest correlation with physical activity included exercise self-efficacy, self-regulation, perceived quality of life, perceived opportunities for LTPA on campus, and gender. Short answer responses reflected quantitative findings and offered participants the opportunity to elaborate on these constructs. Results also indicated SWD may be more active than previously thought, yet still critically low relative to physical activity guidelines for aerobic health. These results helped to elucidate the LTPA levels

of SWD. Although all external and internal variables examined had significant relationships to physical activity level, internal variables had the strongest correlations to physical activity level. It was also found that significant internal variables had strong correlations to external variables, indicating a complex relationship between SWD external-environmental influences, internal-personal influences, and physical activity levels.

5.2 Introduction

In 2011, over 6%, or more than 1.1 million, of the U.S. undergraduate student population has a physical disability [14]. This number is anticipated to continue increasing as a result of the Americans with Disabilities Act of 2008, Healthy People 2010 and 2020, recent additions to the 2010 ADA standards, and the Post-9/11 Veterans Assistance Act of 2008 [87-90]. Although populations of students with physical disabilities (SWD) continues to grow, a dearth of literature exists on their lifestyle habits, specifically pertaining to participation in leisure time physical activities (LTPA) on university campuses. This is particularly concerning for multiple reasons. First, the known physical activity habits of persons with physical disabilities (PWD) in the general population are critically low and some studies have indicated SWD may be similar [12,13,32]. Second, multiple theories and studies have expressed the extensive benefits able-bodied university students gain from participation in LTPA, lasting into adult life. The extent to which SWD may gain similar advantages from participation in LTPA is unknown and warrants inquiry given the far reaching consequences of physical inactivity in this population [3,5,7,33,34,144,156].

It is well studied in the literature that the physical activity levels of PWD in the general population are low. Less than 30% of PWD achieves the recommended 150 min/week of moderate to heavy physical activity for aerobic health [15,16,52]. In fact, nearly 50% of PWD in the general population do not participate in LTPA at all, almost doubling the number of inactive

able-bodied individuals [14]. Studies indicate PWD are at an increased risk of physical deconditioning, often leading to heightened risks of developing cardiovascular and metabolic diseases, overuse injuries, and pain [22,25,65,225]. Physically inactive PWD are also more likely to develop severe secondary disability related symptoms, such as increased spasticity, pressure sores, high blood pressure, and muscle weakness [17,56,61,165]. Most damaging, however, may be the psychosocial repercussions of physical inactivity. Physically inactive PWD have been reported to experience increased risks of anxiety and depression, decreased quality of life and independence, social isolation, perceived lack of acceptance by peers, and low self-esteem [26,29,71,72,74,75,117]. This is particularly concerning, as reports indicate SWD are more likely to experience social isolation and perceived lack of acceptance in comparison to their able-bodied peers [226].

Not only is LTPA an essential component for health and symptom management in PWD, but it has been found to reverse the negative consequences of physical inactivity [56,227,228]. Moreover, participation in LTPA has been reported to improve functional capacity, independence, energy levels, perceived abilities, and overall perceived quality of life [67,94,101,227]. At the university level, many more important benefits may be gained. Although little research has been done on the benefits of LTPA for SWD, research has observed that able-bodied university students who participant in LTPA on their campus have significant improvements in university adherence, academic performance, and stress reduction [1,3,5,34,156]. Additionally, with LTPA participation, able-bodied students have been noted to gain life-long benefits of improved self-perception, perceived peer inclusion, comfort with diverse populations, better socialization in the workforce, and healthy LTPA habits [3,145,156,159,160].

Unfortunately, studies have suggested that the LTPA participation of SWD may mirror those of PWD in the general population. One known study on the LTPA levels of SWD [32] reported that nearly 70% of SWD visited their university's recreation centers less than 5 times a semester. Other qualitative studies have suggested similar participation rates [11,42], however data on this population is still lacking. These values are drastically lower than the 70-88% of able-bodied university students who reportedly regularly use their university recreation facilities [7-10]. This discrepancy may indicate that SWD are at a heightened risk of developing or experiencing the negative consequences of physical inactivity, as well as missing the essential life-long benefits of LTPA participation at the university level.

As the benefits of LTPA are well known, many studies have sought to determine why PWD remain physically inactive. The most common external-environmental (EE) influences reported for PWD in the general population include availability of accessible facilities, activities, and equipment, transportation, and programming costs [31,37,38]. Although federals laws enacted by the Americans with Disabilities Act (ADA) requires all public facilities and services to be accessible to PWD, a lack of accessible facilities, activities, and transportation remain some of the most prevalent barriers to LTPA for PWD in the general population [31,37,108,229]. Surprisingly, despite the increase in provision of services, SWD have also alluded to these EE influences as barriers on their university campuses [11,32,42]. While the research on EE influences pertaining to SWD is limited, interviews with SWD suggest that personal assistants, knowledge of staff, and university resources, such as physical therapists, also influences their LTPA levels [11,42].

Possibly more influential than EE influences are internal personal (IP) influences to LTPA. The most common IP negative influences to LTPA reported by PWD are lack of time, pain resulting from their disability, and lack of motivation [31,101,105,112]. Qualitative studies have

indicated that, similar to able-bodied individuals and general population PWD, SWD belief in their ability, or self-efficacy (SE), influences their participation [11,47]. Unfortunately, interviews by Dysterheft and colleagues [42], indicated some SWD did not consider themselves capable of performing LTPA or exercise, revealing a significant internally driven barrier to participation. Additionally, research has found that self-regulation (SR), or intent and effort to be physically active is a stronger, direct predictor to LTPA participation than SE in PWD [47,48]. Because the amount of time and preparation for LTPA can be extensive for PWD, SR often overcomes SE [47]. Although interview data suggests this may be true for SWD as well, no quantitative data has extensively investigated the IP influences of SWD [11,42].

As the SWD population continues to grow, the need to better understand SWD LTPA levels and their influences to participation becomes crucial. Developing further research may help universities improve LTPA participation levels amongst SWD with the eventual goal of minimizing existing physiological and psychosocial health disparities between SWD and their able bodied peers.

The purpose of this study was to examine the LTPA participation of SWD and their EE and IP influences to participation on campus. Online mixed methods surveys were used to understand the LTPA participation, EE and IP influences, and significant facilitators and barriers to LTPA of SWD across the U.S. It was hypothesized that a majority of our participants would use their campus recreation centers less than 5 times each semester, similar to values reported by Yoh and colleagues [3], and would have similar LTPA levels of PWD in the general population, as reported in previous literature [13,14,32]. It was also hypothesized that participants would report similar, but less, EE barriers to LTPA as PWD in the general population due to services provided by universities [31]. Finally, it was hypothesized that participants would report similar IP

influences to LTPA as their able-bodied peers, as reported in previous literature; however, they would also report more IP influences related to health and disability [40,42,101]. Information gained from this study may contribute to the existing literature and provide more detailed data for universities and disability resource centers to improve the university experiences and lifestyle habits of SWD.

5.3 Methods

5.3.1 Study Design

A mixed methods study design was implemented using previously validated quantitative surveys and short answer questions distributed through an online format. Using mixed methods, researchers were able to use complimentary strategies for data collection to strengthen interpretations [176]. For example, surveys were used to measure demographic information, current LTPA levels, EE influences, IP influences, and barriers to LTPA. Open-ended, short answer questions were added to surveys to allow participants the opportunity to provide more detail when desired. Quantitative demographic and survey data were examined for descriptive statistics and relationships between variables using correlational and regressions analysis. Qualitative analysis was performed on the surveys and short answer questions were analyzed for common themes relating to survey content using thematic analysis [180,208]. We acknowledge that analysis of qualitative data is subject to researcher interpretation and bias, therefore measures were taken to better recognize the possible bias of each researcher and minimize this bias in the analysis of the data [182].

5.3.2 Participants

In order to examine SWD at multiple universities, ranging in size and accessibility level, 16 universities with recreation facilities and disability resource centers were contacted to aid in the recruitment of participants for this study. Disability resource centers are specific offices at each university that provide assistive academic and campus accommodations, such as note-taking, transportation, or physical therapy, to SWD. In order to access these accommodations, SWD must register with their university's disability resource center. Of the 16 universities contacted, seven agreed to aid in the distribution of recruitment materials to registered SWD. The study protocol was approved by the researchers' university institutional review board and all participating universities.

Due to student confidentiality and university research regulations, recruitment materials were provided to a representative from each university and distributed to students. Snowball recruitment methods were also used, in which participants could inform others of the study and pass on recruitment materials. Recruitment materials included informational posters, emails, and social media postings that contained direct contact information for the lead researcher of the study and inclusion criteria. Inclusion criteria required participants be between 18-30 years of age, enrolled ¾, full or within three years of graduation from a university with a campus recreation center, and identify as an individual with a physical disability effecting mobility or vision. Only students with mobility or visual impairments were chosen for this study, as previous research has demonstrated that students with intellectual, hearing, or mental health disabilities tend to experience less barriers to LTPA in comparison to those with mobility or visual impairments [11,204,230]. Sixty-one individuals volunteered for participation in the study. Five did not meet the study inclusion criteria and 16 did not complete the study requirements for

participation (i.e. returned informed consent or completion of all survey measures). This resulted in a final sample of 40 participants. Participant demographics are reported in Table 8.

5.3.3 Measures

A mixed methods survey design was used to obtain complimentary quantitative and qualitative data. A stronger understanding and interpretation of the data can occur by integrating reliable and validated survey measures with short answer, qualitative explanations [176,231]. To capture participant LTPA participation levels of SWD, EE influences, and IP influences to LTPA participation, a total of seven survey measures were used. Surveys were distributed using the online survey website, SurveyMonkey.com. SurveyMonkey.com was chosen for survey dissemination because the highly rated accessibility to PWD [232]. Survey results were directly exported into an excel spreadsheet for analysis.

These survey measures examined participants' current physical activity levels, exercise self-efficacy (SE), perceived quality of life (QOL), self-regulation (SR), barriers to exercise, and perceived social inclusion. The survey measures are described below.

5.3.3.1 Survey Tools

The Physical Activity Scale for Individuals with Physical Disabilities (PASIPD) was used to measure the current physical activity levels of participants [19,68]. The PASIPD is a reliable and valid 13-item survey developed to measure the physical activity levels in four categories: Leisure Time Activity (6 questions), Household Activity (6 Questions), and Work-Related Activity (1 question) [19,68]. Each question calls for participants to recalls the number of days in the past week, as well as the number of hours each day, they performed a specific type of activity. Reponses for each item are multiplied by a corresponding MET value for that specific activity. This scoring method results in an estimation of participant activity levels in MET

hr/day. Scores range from 0-199 MET hr/day. This measure provides a numerical value for population assessment and comparison to similar populations in both previous and future studies (*see Appendix for PASIPD*).

The Leisure Time Physical Activity Questionnaire for People with Spinal Cord Injury (LTPAQ-SCI) Participation in LTPA was used to measure LTPA levels of participants [209]. The reliable and valid 6-item scale is a self-report measure developed for individuals with spinal cord injury [209]. The questionnaire assesses the number of minutes of mild, moderate, and heavy intensity LTPA a participant performed over the 7 days prior to testing. Using the Godin method, participant physical activity levels can be scored for comparison to other activity measures [210]. This questionnaire provides critical information of time and intensity level of LTPA participation. In order to gain more specific information for this study, three short answer questions were added to each category of intensity. These short answer questions addressed the type of LTPA performed, the location or facility in which LTPA were performed, and the equipment or resources used to perform the LTPA. Two additional questions were also added to the end of the survey pertaining to long-term use of their campus recreation facility (*see Appendix for LTPAQ-SCI)*.

To measure the IP variable of perceived QOL, participants completed the WHO Quality of Life-BREF [211,212]. The WHO QOL-BREF is a valid and reliable shortened version of the WHO QOL 100, consisting of 26 items that measure domains of Physical Health (7 items), Psychological Health (6 items), Social Relationships (3 items), and Environmental Health (8 items) [211]. The last two items measure overall perceived QOL and general health. Items are rated on a 5-pt Likert scale to determine raw item scores. Mean scores are used to calculate the final

overall score, ranging between 4-100. Higher scores indicate a greater perceived QOL of participants for the subscales (*see Appendix for WHO QOL-BREF*).

The IP variable of exercise specific SE was measured using the SCI Specific Exercise Self-Efficacy Scale (ESES) [53]. The ESES is a reliable and valid 10-item scale measuring participant's confidence in performing physical activity and exercise [214,218]. Questions specifically referencing spinal cord injury (SCI) were changes to reference general physical disabilities. Each item is rated on a 4-pt Likert scale and results are summed to produce a final score ranging from 10-40. Higher scores indicate a greater perceived exercise SE (*see Appendix for the ESES*).

Another IP variable, SR, or intentions to participate in LTPA, was measured with two items used previously in research on PWD [49,134,233]. The two items asses the intentions of an individual to perform heavy and moderate physical activity over the coming four weeks [234]. Items are rated on a 7-pt Likert scale. Scores are summed for results, ranging from 2-14. Higher scores indicate a greater level of intentions to perform exercise (*See Appendix for SR items*).

The IP and EE variables of social inclusion and opportunities the Social and Community Opportunities Profile – Shortened Version (SCOPE) was used [215]. The SCOPE is comprised of 9 domains to measure perceived social opportunities and inclusion: Leisure and Participation, Housing and Accommodation, Safety, Work – Employed, Work – Unemployed, Financial, Health, and Family and Social. Due to the extensive length and broad coverage of the SCOPE, only two domains, the Leisure and Participation and Family and Social, was used for this study. This shortened the original measure from 48-items to 15. Additionally, three short answer items were added to the scope to address barriers to LTPA, facilitators to LTPA, and recommendations for campuses to improve LTPA in SWD. Domains of the SCOPE can be scored and summed,

resulting in values for number of perceived opportunities for LTPA and perceived opportunities for inclusion on campus. Higher values indicate more perceived opportunities and levels of inclusion. For descriptive analysis, each domain was scored and reported individually (*see Appendix for SCOPE measures*).

For both EE and IP variables, the Barriers to Physical Exercise and Disability Survey (B-PEDS) was used to measure the types of barriers that PWD experience to participating in LTPA [38]. The B-PED is a 34-item survey that includes 31 "yes" or "no" responses concerning barriers, and three open-ended questions for additional detail. To make the survey questions applicable to the sample population, the example fitness center provided in the sample "YMCA" was changed to "campus recreation center". The B-PED is analyzed for descriptive statistics, summing the number of barriers and the types of barriers listed by each participant (*see Appendix for B-PED*).

5.3.4 Procedures

Informed consent was obtained by all participants prior to data collection. After participants signed the informed consent forms, they were able to complete the demographics form and surveys confidentially using an ID number. If participants were unable to complete the surveys online, they were given the option to receive hard copies through mail, along with a stamped envelope for return. No participants required mailed, hard copies of the surveys and therefore all materials were distributed online.

The surveys were combined into two waves, Wave 1 (PASIPD, WHO QOL-BREF, and SR questions) and Wave 2 (LTPAQ-SCI, ESES, SCOPE, and B-PED). By combining multiple surveys into each wave, researchers aimed to reduce the amount of time required to complete the surveys and encourage participant completion. Participants were encouraged to complete the

demographics form and Wave 1 within the first week of completing the informed consent and Wave 2 within two weeks. Emails were sent weekly to participants as a reminder to complete the surveys, as well as provide assistance if necessary. Reminder emails were sent for a total of four weeks before ceasing contact. As an incentive to complete both surveys waves, participants were initially informed during recruitment and in each reminder that after completing all survey requirements, they would be mailed $20. Due to limited funding, participants recruited after the sample had reached 25 were informed they would be placed in a drawing to win one $100 Amazon gift card.

5.3.5 Statistical Analysis

All quantitative data was analyzed for violations of normality, outliers, and errors prior to analysis. Additionally, prior to analysis PASIPD and LTPAQ-SCI scores were examined for correlation strength to determine whether an association existed between the two scores and ensure PASIPD could be used as an appropriate representation of LTPA levels. LTPA levels and EE and IP variables were examined for possible influence of gender, sport participation, age, university rank, and duration of disability. Due to the use of multiple Kruskal-Wallis tests to examine the influence of gender and sport participation on LTPA levels and EE and IP variables, a Bonferroni correction was used to set the test significance at $p < 0.01$.

To examine the relationship of external environmental, and IP variables on LTPA levels, a correlational analysis was first used to determine variables with significant relationships to LTPA level. The magnitude of the correlations were interpreted as small, medium, and large based on values of 0.10 to 0.29, 0.30 to 0.49, and 0.50 to 1.0, respectively [83]. Next, to explain the role of these variables on LTPA, a stepwise regression was run to determine strong related variables to examine in a multiple linear regression. Descriptive statistics are reported for all

demographic and survey variables as mean (M) ± standard deviation (SD). A value of $p < 0.05$ was used to determine statistical significance.

Qualitative data was analyzed using thematic analysis [11,208]. Two experienced coders read through the short answer, survey responses to identify, analyze, and interpret common themes relating to the quantitative surveys. Coders used line-by-line, open coding strategies [180,208] with guidance from the survey question content. Themes directly related to survey content were compared to quantitative survey results to provide deeper understanding of participant answers. All results were summarized under each theme in a codebook to be reviewed by an external auditor to address bias, discrepancies, or outstanding concerns [180,186]. Due to the limited content and participant responses, data found during thematic analysis are reported following their corresponding survey questions and not as individual themes.

5.4 Results

5.4.1 Mix-Methods Results

Descriptive statistics from demographic and survey measures can be found in Table 8. Survey data was collected over a 4 month time span from February to June. Results of the PASIPD indicated participants had higher mean scores those reported in previous literature for young adults with physical disabilities PWD [165,235-237]. Participant scores for each domain of the WHO QOL-BREF, ESES, and B-PED were similar to those reported in previous literature for young adults with physical disabilities [83,92,228,238,239]. No comparative scores were found for the SR items or the modified SCOPE items. The sample was found to be relatively homogenous in use of assistive mobility devices (*see Table 8*). 27 of the 40 participants (68%) relied on a manual wheelchair, power wheelchair, or a walker for mobility assistance and 2 of the 40

participants relied on a cane or service canine for visual assistance. Only 8 of the 40 (20%) of the participants did not rely on assistive devices for everyday mobility.

5.4.1.1 LTPA Participation

Results of the LTPAQ-SCI indicated 10 participants (25%) did not participate in mild LTPA, 18 (25%) did not participate in moderate LTPA, and 22 (55%) did not participate in heavy LTPA in the week prior to survey completion. Overall, 6 (15%) participants reported they did not participant in any LTPA over the previous week. In short answer questions, participants reported a large range of activities for LTPA participation, consisting of daily house chores, walking to pushing to class, and therapy or planned exercise. Primarily, two locations were reported for LTPA participation, in their home or dorm (n = 15, 44%) and outdoors (n = 17, 50%), both on and off campus (i.e. sidewalks or local parks). Of the participants who reported participating in LTPA (n = 34, 85%), 14 reported utilizing their campus recreation facilities for LTPA and 6 reported using disability resource facilities or adapted gyms provided by their university. The range of equipment used by participants also varied. Reported equipment used included assistive technology and mobility devices, personal assistants or therapists, and weight equipment.

Of the 20 (50%) participants who reported using their campus recreation facilities $\geq$ 1 time during the previous month, the average use was 10.5 ± 8.6 times (Median: 8.50). Participants who reported using their campus recreation facilities $\geq$ 1 time during the previous semester (n = 20, 50%) went an average of 34.8 ± 33.8 times (Median: 22.5). Only 12 and 13 of the 20 participants who reported use of facilities during the previous month and semester, respectively, indicated they were competitive in club, collegiate, or national level athletics. Only

26 of the 40 participants reported ever using their campus recreation facilities. Of these 26, 19 reported having positive experiences and 6 reported negative experiences. Participants with negative experiences described self-consciousness, lack of helpful staff, and non-accessible facilities made experiences negative. Participants with positive experiences indicated in short answer responses that helpful and friendly staff, accessible equipment, and a variety of adaptable activities made experiences positive. 12 of the 40 participants reported that health problems caused them to stop exercising.

5.4.1.2 Influences on LTPA Participation

Results of the B-PEDS indicated the top five barriers to LTPA were lack of time due to school/work (*n* = 29, 73%), lack of physician instruction to exercise (*n* = 23, 58%), lack of energy (*n* = 20, 50%), pain from disability (*n* = 18, 45%), lack of motivation (*n* = 17, 43%), and believing a university exercise instructor would not be knowledgeable enough to assist with exercise programming (*n* = 17, 43%). Other common barriers were cost of programming (*n* = 14, 35%), lack of accessible facilities (*n* = 14, 35%), and self-consciousness (*n* = 12, 30%). 13 participants expressed concerns about participating in LTPA on their campus and 29 participants expressed barriers to LTPA existed on their campus. Common themes between concerns and barriers to participating in LTPA on campus included lack of accessibility, i.e. buildings, transportation, and equipment, lack of knowledge staff or assistance, lack of opportunities for LTPA, and fear or self-consciousness of judgement from others. Of the 40 participants, 8 (20%) indicated they felt their campus did not have accessible leisure, sports, or fitness facilities and 19 participants (48%) reported not using leisure, sport, or fitness facilities on their campus.

In short answer responses, 26 (65%) participants described facilitators to LTPA that existed on their campus and 35 participants made recommendations for improvements on their campus. The most common facilitators reported were accessible equipment, positive campus attitude towards disability and disability resources, and available staff for training, education, and exercise assistance. Common suggestions to improve the LTPA participant of SWD on campus included improved advertising of adapted opportunities, provide activities that can be adapted for all levels of ability, provide knowledgeable personal assistants or trainers, and offer activities in the dorms to reduce transportation barriers.

5.4.2 Quantitative Results

PASIPD scores and LTPAQ-SCI scores violated normality (Shapiro-Wilk $p < 0.05$). Removal of outliers was not performed from the PASIPD or LTPAQ-SCI scores due to limited sample size. Spearman's rho correlations tests were used to examine levels of association between physical activity measures. Preliminary analysis of scatterplots found the variables to be monotonic. Results of the Spearman's rho indicated high, significant correlations between the PASIPD and the LTPAQ-SCI scores $r_s\,(38) = 0.76$, $p < 0.01$. As a result of the high correlation, for comparative purposes to other literature, participant PASIPD scores were used to represent physical activity levels for correlative and predicative analyses.

An independent samples Kruskal-Wallis tests showed moderate, but insignificant differences between male and female participants for all variables (Table 9). An independent samples Kruskal-Wallis test showed significant differences in variables as a result of participant identification of athletic participation (Table 9). Participants who identified as participating in a club, collegiate, or national level sport had significantly higher scores for the PASIPD, ESES, SR, and Opportunities for Inclusion (Table 9). Nonparametric Spearman's rho tests showed no

demographic variables were significantly correlated to PASIPD scores: Age: r_s (38) = -.28, p < 0.10; Rank at University: r_s (38) = -0.13, p < 0.47; Duration of Disability: r_s (38) = 0.02, p < 0.93. Due to the violation of normality of PASIPD scores and other variables (Shapiro-Wilk = p < 0.05), Spearman's rank order correlations analyses were used to examine the relationship of EE, and IP variables on PASIPD scores. Multiple significant correlations were found between PASIPD scores, EE, and IP variables (Table 10). All EE and IP variable correlations results are reported in Table 10.

To extract independent variables affecting PASIPD scores, possible influential variables were selected using a stepwise regression (cut off value p < 0.20). Based on these results, the following variables were included in multiple linear regression analysis: SR, QOL Social Relationships, and Gender. Linearity was assessed and found by partial regression plots and a plot of studentized residuals against predicted values. Independence of residuals was found (Durbin-Watson = 2.12). Homoscedaticity was found by visual inspection of studentized residuals versus unstandardized predicted values. No evidence of mutlicolinearity existed, as no tolerance values exceeded 0.1. Three participants were removed from the dataset as outliers, violating Cook's distance or leverage values. Using the variables reported above, the multiple linear regression model statistically significantly predicted PASIPD score, F(3, 33) = 19.43, p < 0.01, R^2 = 0.64, adj. R^2 = 0.61. Regression coefficients and standard errors can be found in Table 11.

5.5 Discussion

As the number of college students with disabilities continues to grow it becomes essential to understand the extent to which SWD participate in LTPA and their unique influences to

participation. This study provides a mixed methods analysis contributing novel information to an increasing body of literature on LTPA participation levels amongst SWD, as well as the factors influencing participation levels on university campuses. Interestingly, data from this study also provides participant recommendations to improve LTPA for SWD that may assist in the design and development of adapted recreation programs.

Our first hypothesis was partially supported by the data. Results demonstrated that 50% of participants did not use their campus recreation or fitness facilitates over the previous month or semester, indicating similar participation numbers to Yoh and colleagues [32]. While this percentage is still considerably lower than the LTPA levels of able-bodied university students, the LTPA levels reported by participants in this study were higher than those previously reported in SWD [9,32,34,144]. For example, Yoh and colleagues observed only 32% of their SWD sample population used campus recreation facilities more than 5 times a semester, in comparison to 43% of participants in the current study [32]. Additionally, only 6 of the 40 participants (15%) in the current study reported not participating in any LTPA at the time of the study. This may indicate that although many SWD are not using campus recreation facilities, they may still be participating in LTPA in other environments. However, it is unknown whether participants were active in other environments due to lack of accessibility and programing for SWD at recreation facilities, or simply due to preference. While many influences to LTPA were addressed in short answer responses, their relationship to LTPA environment was not clearly stated. This may be a limitation of participants' interpretation of short answer questions. Future research should address why SWD participate in LTPA in specific environments to determine whether they are by choice, convenience, or due to lack of accessibility and programming.

Similar to previous research, many participants indicated their participation in activities of daily living, such as walking to class or cleaning, were sources of LTPA [42]. Although many participants indicated they considered activities of daily living to be LTPA, they also expressed a need for more LTPA opportunities on campus. When asked what types of equipment was used during their LTPA, most participants reported using assistive mobility devices for LTPA, such as walkers, braces, and wheelchairs (both sport and everyday wheelchairs). Few participants reported using adaptive exercise equipment, such as arm ergometers or weight machines, often for sport or competitive practice. This may be a result of necessity, as many participants expressed activities of daily living as their LTPA and require the use of their assistive mobility devices. However, this may also be due to a lack of adaptive equipment available to SWD on campus or, as one participant described, sometimes using adaptive equipment can draw too much attention to a PWD, making them feel uncomfortable. Possibly for that reason, participants whose universities had specific fitness areas, gyms, or physical therapy areas for SWD stated they often used adaptive equipment, such as weight machines, in those areas over the main recreation centers. Most participants also reported that personal assistants and physical therapists were 'equipment' for their LTPA. Participants explained that assistants and therapists provided manual resistance to assist with stretching and muscle strengthening exercises. Future research should further investigate the numbers of SWD participating in LTPA outside of their campus facilities, the equipment, or assistants, used, and why. If SWD are not utilizing accessible facilities or equipment, universities would be best benefited understanding why to make improvements or changes.

Unfortunately, results of this study indicate participants reported similar rates of physical inactivity to PWD in the general population. LTPAQ-SCI scores indicated 23 participants (57%)

were not meeting the minimum physical activity requirements for aerobic activity at the time of the study [15,16,52]. Although this is less than the 73% of PWD in the general population who do not meet physical activity recommendations, it is still much higher than individuals without disabilities [12]. This data indicates physical inactivity may constitute a critical issue for SWD, as well as PWD in the general population. Previous studies have observed a significant drop in SWD LTPA levels as they transition from high school to college [43]. This may suggest universities are a crucial point in life for SWD to maintain LTPA from high school or adopt new LTPA practices to carry into adulthood [13,161,162].

Our second hypothesis was partially supported by the data, as participants reported very similar EE influences to LTPA as PWD in the general population. Participant influences that are most common to those reported by PWD in previous literature are knowledge, transportation to the facility, and accessible facilities and equipment [31,38,101]. Some participants reported that the availability of these EE influences acted as facilitators to LTPA and were significant to their LTPA participation on campus. It was noted in the short answer option that 19 participants reported having positive experiences with their campus recreation centers, often due to EE influences including knowledgeable/friendly staff, accessible equipment, and accessible facilities. However, even participants who reported having positive experiences, indicated the absence of additional influences served as barriers to LTPA. For example, one participant expressed having a positive experience because her university recreation center had a knowledgeable trainer on staff to assist SWD with exercise. However, her recreation center lacked adaptive, accessible equipment that acted as a barrier to many LTPA. Many participants also reported crowded facilities, lack of assistants or staff, and a general lack of adapted activities available were influential as barriers to participation. The reported lack of

opportunities and accessibility is particularly concerning as most universities provide transportation, facilities, and recreational services for free to students. According to federal laws enacted following the ADA, all transportation, facilities and opportunities should be accessible to SWD [135]. Although many participants did not elaborate on their answers, future research on the accessibility of transportation and facilities may be necessary to bring awareness to issues on university campuses. This research can also inform universities on the specific resources SWD use and what influences their use of resources. Additionally, recreation programs and facilities should be aware of possible unintentional exclusion of SWD due to inaccessibility or lack of adaptive programming.

Analysis of survey scores indicated that participants' perceptions of opportunities for LTPA on campus was strongly correlated with their PASIPD scores. This relationship was strongly supported in participant short answer data, as perceived opportunities for LTPA on campus was frequently expressed as influential to LTPA participation on campus (Table 10). Participants expressed that the presence of adaptive fitness classes, club sport, and collegiate sport opportunities positively influenced their LTPA participation. Unfortunately, 9 participants (22%) stated a lack of opportunities acted as a barrier to participation and 16 (40%) stated their university could improve SWD LTPA participation by providing more adapted recreation opportunities. Interestingly, participants' perceptions of opportunities for LTPA on campus was also strongly correlated to SE, SR, and perceptions of opportunities for inclusion on campus (Table 10). Although the extent of these relationships are unknown, they may indicate multifaceted benefits of providing more LTPA opportunities for SWD on campus. While this may be difficult to address for some universities, participant suggestions articulating the need for

the provision of adapted activities for various levels of ability could be a cost-effective and more inclusive solution over creating new, adapted programming.

The third hypothesis was supported by our data and previous literature [47]. Results of the survey analysis revealed that SR, SE, perceived opportunities for inclusion on campus, and perceived QOL were significantly correlated with participant LTPA levels (Table 10). SR and QOL Social Relationships were also found to be significant variables correlating to LTPA levels during the regressions analysis (Table 11). These findings are consistent with previous studies on PWD in the general population, observing SR as the most significant, direct predictor of physical activity participation in PWD over SE [47,48]. Because LTPA may require extensive preparation for PWD, it is theorized that time management and scheduling often trumps the influence of an individual's SE [47]. This was supported by participant short answers, as some participants expressed that getting to the facilities on campus was more difficult than the LTPA itself. Additionally, the influence of SE was primarily expressed as a barrier to participants, as they expressed feelings of self-consciousness and lack of knowledge of how to exercise. Although not significant to the regression analysis, SE was strongly correlated with the PASIPD and other EE and IP variables, indicating it may have greater underlying influences to LTPA or be strongly influenced by other factors (Table 10) [47,132]. Interestingly, to overcome these barriers, multiple participants recommended the provision of knowledgeable assistants, holding adaptive fitness classes in student dormitories where SWD live, or providing adapted gyms or areas of the recreation center. Although these recommendations may not be feasible for all universities, preparation, time, and SWD SE should be taken into consideration for class design.

Interestingly, the significant correlation found between QOL Social Relationships domain with LTPA, although least supported by participant short answers, is consistent with previous

literature [11,42,74]. Only one of the 40 participants indicated that peers acted as a facilitator for participation in LTPA. This may be a limitation of the question content, as a study by Dysterheft and colleagues observed SWD expressed peers positively influenced their LTPA levels, encouraging them to participate (*see Chapter 3*) [42]. This was also noted in research by Devine, which found that a motivator for SWD to participate in LTPA was to build new social relationships, similar to findings on able-bodied university students [11,145]. It is possible that participants misinterpreted the constructs of the QOL Social Relationships domain (peer relationships and social support) to represent both peers and university disability resources. Although social support has not traditionally included disability resource centers, some participants indicated that supportive disability resources and staff provided positive influence on their LTPA participation. This may indicate that university resources and support from university staff may provide a strong facilitator to SWD, specifically for new or incoming SWD.

Although a weaker correlation was found between perceived opportunities for inclusion on campus and PASIPD score, the relationship was highly supported by short answer data. Participants indicated that having a campus with a positive attitude towards disability and a supportive disability resource center was a positive influence to their LTPA participation. Similarly, participants also reported a lack of communication or outreach of adaptive activities into the campus community negatively influenced LTPA levels. Results of correlational analysis indicated a strong relationship between participant perceptions of opportunities for LTPA on their campus and opportunities for inclusion (Table 10). This may indicate that universities with few LTPA opportunities for SWD, or a lack of outreach to SWD, may increase feelings of social isolation from the campus community. Recommendations for improvements included better promotion of available services and activities for SWD and recreation programs that integrate

SWD with able-bodied peers. However, some participants who felt self-conscious or judged when using recreation facilities suggested programs specifically for SWD. These conflicting views are particularly interesting, as they shed light on the diverse opinions of SWD, as well as the significance of social acceptance for PWD [29,30]. Feelings of social stigma have been postulated to further isolate PWD and decrease interactions with the community [29,240]. Overall, reducing feelings of isolation and promoting disability acceptance in the campus community may be key factors in SWD LTPA participation [11,102]. During the design of adapted recreation programming, universities should be mindful of outreach strategies to ensure inclusion and awareness of activities for SWD.

Although it was not a main focus of this study, it should be addressed that participants who were competitive in club, collegiate, or national level sports did have significantly higher scores for the QOL Physical Health, QOL Environmental Health, SE, SR, and perceived opportunities for LTPA. They also had significantly less perceived barriers to LTPA. These results are supportive of previous research on the positive relationships between LTPA participation and psychosocial outcomes in PWD [94,103,104,106,204]. However, as no causational analysis was performed, these results should be interpreted with caution, as it is unknown whether participant scores were higher as a result of sport participation or vice versa.

5.6 Limitations

Before conclusions can be drawn, limitations of the study should be address. First, the data collected in this study is from a limited sample of SWD who voluntarily participated in the completion of the surveys. Although all data was collected during the spring semester, collecting survey data over a four month period may cause discrepancies in LTPA levels and influences due to exams, weather, academic breaks, etc. While the short answer portion of the surveys

allowed participants to elaborate and provide more detail on LTPA levels and influences, participant responses were limited to their interpretation of the question. Some participants did not respond to short answer questions in a way that coincided with the survey question, or did not respond to them at all. Therefore, despite the concurrent design of the survey and short answer questions, not all qualitative data had strong associations to quantitative data [241]. Additionally, two of the surveys, LTPAQ-SCI and ESES, were specifically designed and validated for individuals with SCI, however, no specific items in the surveys limited application to other disability types or conditions. Finally, although these participants were relatively homogenous in physical limitations, the sample size was small and environmentally diverse, including participants from 16 different universities. Because of this limited sample size and the likelihood that universities had varying ranges of disability services and LTPA opportunities, results of this study should be interpreted with caution. Additionally, running multiple statistical tests on a small sample size inflated the chance of a type 1 error. Therefore, these results should be interpreted with restraint and the acknowledgement that the influences reported by participants may not apply to all campuses and populations. While multiple measures were used to gather a large amount of comprehensive, rich data, due to these limitations, caution is recommended when generalizing results to other populations and environments.

5.7 Conclusion

This study was the first to use mixed methods to examine the LTPA levels of SWD and their influences to LTPA participation. Interestingly, all of the EE and IP variables had significant correlations to PASIPD scores, indicating the complexity of influences to SWD LTPA participation. Critical information on the LTPA levels of SWD was gained, as well as

information on how universities can address these influences to provide SWD with life-long benefits.

5.8 Tables

Table 8. Participant demographics and survey scores

	n		M (SD)
Total Sample	40	**Age (years)**	23.03 (3.80)
Gender		Range	18-31
Male	12	**Duration of Disability (years)**	16.75 (8.50)
Female	27	Range	1-31
NA	1	**PASIPD**	20.79 (15.06)
Enrollment		**Min/Week LTPA**	
Full-Time	40	Mild	169.5 (252.8)
Part-Time	0	Moderate	88.1 (125.3)
Class Rank		Heavy	180.5 (336.8)
Freshman	10	**Godin LTPA**	34.0 (30.1)
Sophomore	3	**QOL WHO-BREF**	
Junior	3	Physical Health	67.45 (17.36)
Senior	7	Psychological Health	68.20 (15.97)
Graduate	16	Social Relationships	68.10 (21.93)
NA	1	Environmental Health	75.15 (13.37)
Sport Participation		**ESES**	29.25 97.98)
Yes	15	**SR**	9.45 (4.36)
No	25	**SCOPE**	
Assistive Mobility Device(s)		Opportunities for Inclusion	24.5 (5.84)
None	8	Opportunities for LTPA	5.85 (2.23)
Manual Wheelchair	14	**B-PEDS**	8.53 (4.07)
Power Wheelchair	10		
Walker/Crutch	13		
Lower Limb Braces	5		
Prosthetic	3		
Visual Cane/Canine	3		

Table 9. Independent samples results

Variable	Male M(SD)	Female M(SD)	*p*	Sport Participation M(SD)	No Sport Participation M(SD)	*p*
n	12	27		*15*	25	
PASIPD	18.90 (17.66)	20.22 (12.29)	0.15	30.34 (12.87)	15.05 (13.44)	0.01*
WHO QOL-BREF						
Physical Health	75.08 (13.39)	63.78 (18.26)	0.28	76.80 (13.72)	61.84 (17.11)	0.02
Psychological Health	74.00 (10.51)	65.15 (17.44)	0.22	73.47 (13.84)	65.04 (16.58)	0.11
Social Relationships	66.58 (22.03)	68.74 (22.68)	0.64	76.60 (21.25)	63.00 (21.12)	0.23
Environmental Health	80.42 (13.10)	73.26 (13.17)	0.32	83.13 (11.45)	70.36 (12.26)	0.03
ESES	30.25 (8.75)	28.67 (7.86)	0.72	34.27 (4.20)	26.24 (8.25)	0.00*
SR	9.25 (4.67)	9.37 (4.29)	0.51	12.60 (2.77)	7.56 (4.05)	0.00*
SCOPE						
Opportunities for Inclusion	25.42 (5.57)	24.07 (6.11)	0.99	25.20 (6.52)	24.08 (5.48)	0.28
Opportunities for LTPA	6.00 (1.86)	5.81 (2.43)	0.87	7.07 (2.12)	5.12 (1.99)	0.01
B-PEDS	6.50 (3.55)	9.37 (4.10)	0.79	6.20 (2.98)	9.92 (4.04)	0.03

Note:* denotes significance at $p < 0.01$ level

Table 10. Correlations results for external environmental and internal personal variables

Variable	PASIPD	QOL Physical Health	QOL Psychological Health	QOL Social Relationships	QOL Environmental Health	ESES	SR	Opportunities for Inclusion	Opportunities for LTPA
QOL Physical Health	0.45 (0.00)**	-	-	-	-	-	-	-	-
QOL Psychological Health	0.34 (0.03)*	**0.68 (0.00)****	-	-	-	-	-	-	-
QOL Social Relationships	0.45 (0.00)**	0.49 (0.00)**	**0.57 (0.00)****	-	-	-	-	-	-
QOL Environmental Health	0.32 (0.05)*	**0.60 (0.00)****	**0.67 (0.00)****	**0.55 (0.00)****	-	-	-	-	-
ESES	**0.63 (0.00)****	0.47 (0.00)**	0.34 (0.03)*	0.34 (0.03)*	0.41 (0.01)**	-	-	-	-
SR	**0.74 (0.00)****	0.39 (0.01)*	0.30 (0.06)	0.21 (0.19)	0.19 (0.25)	**0.73 (0.00)****	-	-	-
Opportunities for Inclusion	0.37 (0.02)*	0.24 (0.14)	0.41 (0.01)**	0.23 (0.15)	0.30 (0.06)	**0.53 (0.00)****	0.42 (0.01)**	-	-
Opportunities for LTPA	**0.51 (0.00)****	0.32 (0.04)*	0.36 (0.02)*	0.29 (0.07)	0.38 (0.02)*	**0.70 (0.00)****	**0.67 (0.00)****	**0.51 (0.00)****	-
B-PEDS	-0.34 (0.03)*	**-0.56 (0.00)****	-0.43 (0.01)**	-0.12 (0.46)	-0.40 (0.01)*	**-0.64 (0.00)****	-0.47 (0.00)**	-0.44 (0.00)**	**-0.50 (0.00)****

Note: All correlations reported as $r_s(p)$; *denotes significance at $p < 0.05$; **denotes significance at $p < 0.01$; strong correlations are bolded in the table

Table 11. Results from the multiple regression analysis

Variable	*B*	SE_B	ß
Intercept	-1.032	7.10	-
SR	2.08	0.34	0.65**
QOL Social Relationships	0.17	0.07	0.27*
Gender	-7.26	2.94	-0.26*

Note: *denotes significance at $p < 0.05$; **denotes significance at $p < 0.01$

CHAPTER 6: CONCLUSION

6.1 Introduction

The purpose of this dissertation was to investigate participation in leisure time physical activity (LTPA) amongst university students with physical disabilities (SWD) on university campuses. My research was focused on understanding SWD perceptions, participation levels, influences, and outcomes of their participation in LTPA. The primary goals for this research were to understand the factors influencing participation amongst SWD to improve recreational programming for SWD so they may derive the benefits of LTPA.

To achieve these goals, I completed three studies, outlined in Chapters 3-5. For the first study (Chapter 3) we used mixed methods to gather in-depth information aim understand how SWD perceive and define physical activity, as well as what influences them to participate in physical activity on their university campus. In the second study (Chapter 4) we designed a new, adapted recreational physical activity course for SWD and used a mixed methods analysis to investigate participant experiences and their perceived psychosocial outcomes of participation. Finally, the third study (Chapter 5) expanded on information from the previous chapters and we used mixed methods surveys to examine the participation in and influences to LTPA of SWD from multiple universities.

The studies in Chapters 3-5 reveal SWD perceptions, experiences, outcomes, influences, and future recommendations for adapted recreational programming. In each chapter, future research and design recommendations are made in hopes to improve the LTPA opportunities and the university experiences of SWD. In the following sections, I briefly summarize the major findings from this dissertation, as a whole. I'll also discuss implications, goals for future research, and general recommendations for universities based on the findings from this

dissertation. For more in-depth discussions of the specific results, limitations, and implications from each study, please see each chapter's Discussion sections.

6.2 Discussion of Findings

6.2.1 Perceptions and Definitions of Physical Activity

Starting in Chapter 3, we were able to uncover how SWD perceived physical activity. Initially, we understood that by interviewing SWD who attended a university recognized for its dedication to services for SWD, results of the study may be limited. However, we found that even in a highly supportive environment, SWD revealed a disbelief that they could be physically active due to their disability. This was also observed in participant responses in Chapter 5, as some participants stated that physical activity wasn't necessarily possible for some PWD. Although some participants indicated they participate in recreational LTPA, such as weight lifting, aerobic classes, etc., most participants from studies in Chapter 3 and Chapter 5 defined activities of daily living, such as showering, getting to class, and cleaning, as LTPA sources. A majority of the participants from these studies also expressed that physical and occupational therapy were sources of physical activity. It is extremely concerning that numerous participants reported the belief that recreational LTPA is not possible to perform due to their physical limitations. These negative beliefs likely significantly influence an individual's physical activity levels, as well as their self-efficacy (SE) and self-regulation (SR), two of the strongest relating variables to LTPA levels, as observed in Chapter 5.

Due to the limitations of each of these studies, I aim to conduct future research examining these perceptions of SWD using larger samples and from multiple universities. It would also be beneficial to better understand the age at which these perceptions develop. Therefore, I plan to

research the perceptions of children and adolescents with physical disabilities (AWD) on their ability to be physically active. If these negative perceptions are developed early in life, addressing them at younger ages may be beneficial in increasing life-long LTPA levels. Further, to address these negative perceptions, further research should examine the design of educational, LTPA based interventions aimed to improve perceptions of ability in youth and persons with physical disabilities (PWD), as observed as outcomes in Chapter 4.

In order to address these negative perceptions in SWD, university disability resource centers may need to provide educational opportunities to help redefine any negative perceptions SWD may have on their ability to participate in LTPA. Previous studies, including Chapter 4, have observed that PWD who participate in LTPA or sports experience a significant increase in their perceived abilities [42,87,94]. By providing introductory and educational LTPA opportunities, SWD may be able to improve their perceptions of ability and overall LTPA levels. However, as emphasized by previous research, SWD should be included in the planning and design of these programs to ensure the needs and desires of SWD are met [205].

6.2.2 SWD Participation in LTPA

Additional important findings from this dissertation were the results of the LTPA participation levels of SWD from research in Chapter 5. Early research on the LTPA levels of SWD indicated that less than 45% of SWD never visited their recreation center over the previous semester, which is similar to the 50% of participants in Chapter 5 [32]. While these results may suggest that those SWD are not physically active, our findings revealed only 15% of participants surveyed did not participate in any LTPA at the time of the study. Data from short answer responses allowed participants to elaborate on this discrepancy by indicating only 35% of participants used their campus recreation centers for LTPA, whereas other more common

locations included the outdoors (i.e. sidewalks, parks; 38%) and at home (43%). While these results suggest that SWD are more physically active than previously thought, they also reveal that most SWD are not using their campus recreation facilities for LTPA. This lack of use may be due to SWD interpreting activities of daily living as their primary source of LTPA, such as commuting to class, cleaning, or caring for pets, which take place in the home and outdoor environments. However, this may also be due to a reported lack of accessibility and accessible opportunities present at campus recreation facilities (*barriers to LTPA will be discussed in the next section*).

Unfortunately, analysis of the LTPA data from Chapter 5 also indicated 57% of the participants did not meet the 150 min/week of moderate to heavy LTPA requirements for aerobic health [15,16,52]. Although this is lower than the 73% of PWD in the general population who do not meet the requirements, it is much more similar to the 50% of able-bodied university students not meeting requirements for aerobic health [242]. These values suggest that the university setting may provide a more facilitative environment for LTPA participation than communities for the general population of PWD. However, these numbers also indicate that physical inactivity is still a critical issue for this population, as over half of the SWD population may be at heightened risk for symptoms of physical inactivity (*as discussed in Chapter 2*).

Because these sample sizes were limited, I aim to continue this research and increase the size of my sample population of SWD, addressing many more SWD from universities across the U.S. My future research will compare the LTPA rates of SWD and their able-bodied peers attending the same universities to examine potential discrepancies in participation and services for students at specific locations. This research can be used to examine the characteristics of universities with high LTPA participation rates in SWD to understand components of successful

program design. Finally, in the future I aim to examine the LTPA of AWD at the junior and high school level to examine the changes in LTPA participation rates as PWD age and transition into college. This may help determine whether LTPA participation rates significantly decrease when SWD transition into college, as suggested by previous research, or if influences arise earlier in life [43,147,163]. Longitudinal research may also help to indicate when LTPA decreases for effective intervention design.

While the information from this study is limited in application, it provides further insight to the participation of SWD in LTPA. This data enables researchers to compare the participation rates of SWD to both PWD in the general population and able-bodied university students. Similarly, for universities, this data indicates a discrepancy in recreational facility use between SWD and able-bodied university students. It is suggested that universities to create a discussion between their recreational programming committees and SWD to promote and improve their use of facilities and activities. However, it also sheds light on other environments SWD are active in, indicating universities also need to be aware of accessibility and opportunities for LTPA within student living areas and outdoor environments on campus.

6.2.3 SWD Influences to Participation in LTPA

Data collected from the studies in Chapters 3-5 provided a wealth of information on what SWD perceive as influences to their participation in LTPA. Beginning in the study from Chapter 3, it was noted that even on a campus recognized for its support of SWD, multiple external-environmental (EE) influences existed, many of them as barriers. Expanded on in Chapters 4 and 5, some of the most common EE influences included university staff or assistants, available opportunities for LTPA, transportation, and accessibility of facilities and equipment. Many participants from this research reported the presence of these influences facilitated their LTPA

participation, such as adapted activity classes, adaptive equipment, and friendly/knowledgeable staff. In fact, a majority of participants surveyed (Chapter 5) indicated that when they had visited their campus recreation center, it was a positive experience due to the presence of any of these EE influences. Unfortunately, almost all of the participants surveyed and interviewed in these studies reported that when other influences were missing, they became a significant barriers to their LTPA.

Interestingly, many participants from all studies suggested improving and increasing the number of LTPA opportunities for SWD to help improve their LTPA participation. Students interviewed in Chapter 4 expressed that many university 100-level activity classes are not openly adaptive, or promoted as inclusive for SWD. Therefore, participants perceived they have fewer opportunities to gain university credit and participate in activity courses with able-bodied peers. However, these same students also revealed that when activity opportunities were provided to SWD, their expectations were very low, based on negative previous experiences with adaptive recreation. Overall, these EE barriers were particularly concerning and unanticipated, as the universities involved in this study provided transportation, recreational facilities, and activity opportunities to all students. Following the Americans with Disabilities Act (ADA), federal law requires all transportation, facilities and opportunities to be equally accessible to PWD [135], therefore the presences of these influences should facilitate participation, not act as a barrier to it.

In addition to the EE influences, participants in all studies reported internal-personal (IP) influences to LTPA participation. These IP influences stood out to be most significantly related to LTPA participation, both during participant interviews (Chapters 3 and 5) and the survey analysis results (Chapter 5). The most commonly reported IP influences included SR, SE, opportunities for social inclusion, social support, and perceived quality of life (QOL).

Information from the short answer responses and interviews from all studies supported these results. Similar to previous research, many participants from these studies expressed that the effort to prepare for LTPA (SR) was often more extensive than the LTPA itself [47,48]. When this was the case, many participants also indicated they were less likely to participate in LTPA. However, some participants discussed the use of personal assistants to overcome this barrier. Much like the experiences reported in interviews from Chapter 4, participants indicated it was sometimes necessary for knowledgeable personal assistants to be provided in order to participate in an activity. Participants from all studies also emphasized that feelings of self-consciousness, not knowing how to be physically active, and not believing they were capable of LTPA were barriers to their participation. Interestingly, however, in Chapter 5, participants who described their campus communities as having positive attitudes towards disability, supportive for SWD, and having more opportunities for inclusion on their campus were more likely to have higher SE scores and participate in LTPA. Although these IP influences are very similar to those reported by PWD in the general population [31,101], universities may be able to more easily make them facilitators to LTPA by providing services and positive outreach into the campus community.

For the future of this research I aim to examine the accessibility of university campuses and SWD perceptions of accessibility. As many participants in these studies reported a lack of accessibility on their university campuses, their campuses may or may not be meeting ADA regulations for accessibility. If universities are meeting the ADA standards, then more information is needed on why SWD perceive specific facilities and serviced to be inaccessible. Additionally, I hope to examine the relationship between SWD LTPA habits and the degree of campus support for SWD, including opportunities for LTPA, perceptions of inclusion, and

outreach of campus services for SWD. Future research should also look more deeply into these influences to determine how universities can make effective and lasting improvements for SWD.

With this information, universities and researchers can begin to reexamine recreation programming on campus and services, such as transportation and facilities. Because multiple studies have now observed EE influences acting as barriers, it is time for universities to ensure that equal and accessible opportunities are provided to all students. Additionally, given that SWD perceptions of inclusion and support may be strongly related to their SE for participation in LTPA, universities should work to provide a facilitative and inclusive environment for SWD. However, due to the limitations of these studies, it is recommended that universities invite SWD and PWD in the community to participate in committee meetings and provide personal feedback for their campus community [205]. This feedback and future research can provide critical information on how to remove negative influences to LTPA on campus.

6.2.4 SWD Outcomes of Participation in LTPA

A final important finding of this research was the information gained on participant outcomes of LTPA participation. Despite the lack of significant survey findings from Chapter 4, information collected from interviews indicated that participants experienced similar, yet still very unique, outcomes of LTPA participation as their able-bodied peers. During the interviews, participants reported gaining positive social outcomes. While able-bodied university students report social outcomes of LTPA participation, participants from Chapter 4 reported outcomes primarily consisting of building relationships with their exercise personal assistants (EPAs) and less with other participants in the class. This social outcome may be particularly beneficial, as relationships with able-bodied peers may assist in reducing feelings of social isolation and lack of peer acceptance, both often resulting from social stigma of disability [102,219,220]. More

importantly, improving social relationships with diverse populations may be beneficial for SWD both during and after their college years, as it is for able-bodied university students [74,226]. Participants expressed that participation in the class resulted in stress reduction, improved exercise SE, and willingness to try new exercises and activities. Similarly, participants reported gaining knowledge and self-awareness of their own capabilities as a result of participation in the intervention. These benefits may be of particular importance for SWD who may have low perceptions of their ability to exercise or the belief they are unable to participate in LTPA, as observed in Chapter 3. Although the results of this study are limited, they do indicate that SWD experience similar, yet possibly more significant benefits from LTPA than able-bodied university students.

To expand on this research, I plan to continue examining the experiences and outcomes of SWD participating in LTPA. I hope to obtain larger sample sizes and examine the outcomes of this type of LTPA participation at multiple universities. In particular, I aim to use the same focus group methods for intervention design, and then carry out a longitudinal study to examine whether the benefits SWD gain from participating in a LTPA course last throughout their university years. Future research will also include examining whether SWD gain the benefits of improved academic performance and adherence, increased participation in LTPA, and improvements in socialization, as observed in able-bodied university students. Additionally, because the survey measures used in this study were not sensitive enough to detect significant changes from pre- to post-intervention, I would like to develop more effective, sensitive measures to evaluate the benefits of LTPA for SWD.

Although the application of this information is limited, it does provide essential support for the importance of LTPA participation in SWD. Researchers and universities should be

mindful that although aquatic exercise was popular and beneficial for participants at the participating university, it may not be successful at every university. Therefore, as previously recommended, universities should ensure to address their SWD to determine their interests and expectations for adapted programming [205].

6.3 Contribution to Literature

Findings from this dissertation both supported the theories used during research design and contributed new information. First, the primary theories used to design this research, Tinto's Model of Retention [6,7] and Astin's Theory of Involvement [33], were both supported by results of all three studies. Most significantly, results from Chapter 4 indicated that SWD may have beneficial outcomes of LTPA participation. While these outcomes are both distinct and possibly more pronounced than their able bodied peers, it provides evidence that these theories apply to the SWD population. This was the first study to examine these theories in SWD and expand their theoretical application to SWD.

The World Health Organization's (WHO) International Classification of Functioning, Disability, and Health (ICF) model was also supported by this research. Results from all of the studies indicated an interaction existed between an individual's environment, health, and personal self to play an influential role in LTPA participation [44,45]. Results from Chapters 3 and 5 indicate participants perceived accessibility, available activities, health and disability related symptoms, and their confidence, or self-efficacy to exercise, as significant influences to physical activity. Specifically, not only did Chapter 5 reveal a strong relationship between all EE and IP factors and physical activity level, but also a strong relationship between EE and IP factors. This study was one of the first to thoroughly examine this multifaceted interaction on LTPA in SWD and support the theoretical application of the ICF model in SWD.

Finally, findings of this research highly supported the Social Cognitive Theory (SCT) and its application to behavior in PWD in the adult population [46-48]. While it was observed in all three studies, results of Chapter 5 strongly indicated that the factors of SE, SR, QOL, and social support were all significantly related to physical activity level. In support of previous literature on PWD, SR had a more significant predictive relationship with physical activity level than SE [47,48]. These results not only further support the relationship between SCT factors and PWD, but expand the theoretical application to SWD, a previously unstudied population.

6.4 Conclusion

With three studies, this dissertation used mixed methods research to examine LTPA participation in SWD. Data from these studies adds to the literature, providing important, novel information on SWD perceptions, rates, influences, and outcomes of LTPA participation that can be used by both universities and researchers.

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Appendix A

Demographic Questionnaire

Please complete the following information about yourself.

1. 1. Gender (Circle one) Female Male
2. Marital Status (Circle one)

   Married Single Divorced/Separated Widow/Widower
3. Date of Birth:
4. Current University Enrolled at:
5. Years at University:
6. Major:
7. Time Enrollment (Circle one): Full Time Part Time
8. Ethnicity (Circle one)

   American Indian Asian African American Caucasian

   Native Hawaiian or Other Pacific Islander Latino/a

   Other: _____
9. Current Education Level (Circle one):

   Freshman (1st year) Sophomore (2nd year) Junior (3rd year) Senior (4+ years)

   Master's Degree Graduate Student PhD or Equivalent Graduate Student
10. Type of Disability:
11. Year of onset?
12. Type of wheelchair/assistive device(s)? (list all assistive devices used)

    a. Primary:
    b. Secondary:

13. How long have you been using each of these devices?
14. Are you currently competitive in any club/collegiate/national/international athletics?

    a. If yes, please list:

Appendix B

Exercise Self-Efficacy Scale

The items listed below are designed to assess your beliefs in your ability to continue exercising on a three time per week basis at moderate intensities (upper end of your perceived exertion range), for 40+ minutes per session in the future. Using the scales listed below please indicate how confident you are that you will be able to continue to exercise in the future.

For example, if you have complete confidence that you could exercise three times per week at moderate intensity for 40+ minutes for the next four weeks without quitting, you would circle 100%. However, if you had no confidence at all that you could exercise at your exercise prescription for the next four weeks without quitting, (that is, confident you would not exercise), you would circle 0%.

Please remember to answer honestly and accurately. There are no right or wrong answers.

Mark your answer by circling a %: 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

NOT AT ALL CONFIDENT — MODERATELY CONFIDENT — HIGHLY CONFIDENT

1. I am able to continue to exercise three times per week at moderate intensity, for 40+ minutes without quitting for the NEXT WEEK

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

2. I am able to continue to exercise three times per week at moderate intensity, for 40+ minutes without quitting for the NEXT TWO WEEKS

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

3. I am able to continue to exercise three times per week at moderate intensity, for 40+ minutes without quitting for the NEXT THREE WEEKS

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

4. I am able to continue to exercise three times per week at moderate intensity, for 40+ minutes without quitting for the NEXT FOUR WEEKS

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

5. I am able to continue to exercise three times per week at moderate intensity, for 40+ minutes without quitting for the NEXT FIVE WEEKS

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

6. I am able to continue to exercise three times per week at moderate intensity, for 40+ minutes without quitting for the NEXT SIX WEEKS

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

7. I am able to continue to exercise three times per week at moderate intensity, for 40+ minutes without quitting for the NEXT SEVEN WEEKS

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

8. I am able to continue to exercise three times per week at moderate intensity, for 40+ minutes without quitting for the NEXT EIGHT WEEKS

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

"Self-efficacy Scale for 40 minutes" : Sum all items and divide by 8

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Appendix C

Multidimensional Outcome Expectations for Exercise Scale

1. Exercise will improve my ability to perform daily activities:

1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly Agree

2. Exercise will improve my social standing:

1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly Agree

3. Exercise will improve my overall body functioning:

1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly Agree

4. Exercise will help manage stress:

1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly Agree

5. Exercise will strengthen my bones:

1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly Agree

6. Exercise will improve my mood:

1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly Agree

7. Exercise will increase my muscle strength:

1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly Agree

8. Exercise will make me more at ease with people:

1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly Agree

9. Exercise will aid in weight control:

1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly Agree

10. Exercise will improve my psychological state:

1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly Agree

11. Exercise will provide companionship:

1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly Agree

12. Exercise will improve the functioning of my cardiovascular system:

1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly Agree

13. Exercise will increase my mental alertness:

1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly Agree

14. Exercise will increase my acceptance by others:

1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly Agree

15. Exercise will give me a sense of personal accomplishment: 1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly Agree

Appendix D

Barriers Self-Efficacy Scale

BARSE

The following items reflect situations that are listed as common reasons for preventing individuals from participating in exercise sessions or, in some cases, dropping out. Using the scales below please indicate how confident you are that you could exercise in the event that any of the following circumstances were to occur.

Please indicate the degree to which you are confident that you could exercise in the event that any of the following circumstances were to occur by circling the appropriate %. Select the response that most closely matches your own, remembering that there are no right or wrong answers.

FOR EXAMPLE: In question #1 if you have complete confidence that you could exercise even if "the weather was very bad," you would circle 100%. If however, you had no confidence at all that you could exercise (that is, confidence you would not exercise), you would circle 0%.

0 10 20 30 40 50 60 70 80 90 100

Not at all Confident Moderately Confident Highly Confident

I believe that I could exercise 3 times per week for the next 3 months if:

1. The weather was very bad (hot, humid, rainy, cold).

0 10 20 30 40 50 60 70 80 90 100

2. I was bored by the program or activity.

0 10 20 30 40 50 60 70 80 90 100

3. I was on vacation.

0 10 20 30 40 50 60 70 80 90 100

4. I was not interested in the activity.

0 10 20 30 40 50 60 70 80 90 100

5. I felt pain or discomfort when exercising.

0 10 20 30 40 50 60 70 80 90 100

6. I had to exercise alone.

0 10 20 30 40 50 60 70 80 90 100

7. It was not fun or enjoyable.

0 10 20 30 40 50 60 70 80 90 100

8. It became difficult to get to the exercise location.

0 10 20 30 40 50 60 70 80 90 100

9. I didn't like the particular activity program that I was involved in.

0 10 20 30 40 50 60 70 80 90 100

10. My schedule conflicted with my exercise session.

0 10 20 30 40 50 60 70 80 90 100

11. I felt self-conscious about my appearance when I exercised.

0 10 20 30 40 50 60 70 80 90 100

12. An instructor does not offer me any encouragement

0 10 20 30 40 50 60 70 80 90 100

13. I was under personal stress of some kind.

0 10 20 30 40 50 60 70 80 90 100

Appendix E

Self-Rated Abilities for Health Practices Scale

1.	Find healthy foods that are within my budget	1 2 3 4
2.	Eat a balanced diet	1 2 3 4
3.	Figure out how much I should weight to be healthy	1 2 3 4
4.	Brush my teeth regularly	1 2 3 4
5.	Tell which foods are high in fiber content	1 2 3 4
6.	Figure out from labels what foods are good for me	1 2 3 4
7.	Drink as much water as I need to drink every day	1 2 3 4
8.	Figure out things I can do to help me relax	1 2 3 4
9.	Keep myself from feeling lonely	1 2 3 4
10.	Do things that make me feel good about myself	1 2 3 4
11.	Avoid being bored	1 2 3 4
12.	Talk to friend and family about the things that are bothering me	1 2 3 4
13.	Figure out how I respond to stress	1 2 3 4
14.	Change things in my life to reduce my stress	1 2 3 4
15.	Do exercises that are good for me	1 2 3 4
16.	Fit exercise into my regular routine	1 2 3 4
17.	Find ways to exercise that I enjoy	1 2 3 4
18.	Find accessible places for me to exercise in the community	1 2 3 4
19.	Know when to quit exercising	1 2 3 4
20.	Do stretching exercises	1 2 3 4
21.	Keep from getting hurt when I exercise	1 2 3 4
22.	Figure out where to get information on how to take care of my health	1 2 3 4
23.	Watch for negative changes in my body's condition (pressure sores, breathing problems)	1 2 3 4
24.	Recognize what symptoms should be reported to a doctor or nurse	1 2 3 4
25.	Use medication correctly.	1 2 3 4
26.	Find a doctor or nurse who gives me good advice about how to stay healthy	1 2 3 4
27.	Know my rights and stand up for myself effectively	1 2 3 4

28.	Get help from others when I need it	1 2 3 4

Appendix F

Participant Interview Questions (Chapter 3)

1) Can you tell me how you would define a "healthy lifestyle"?

a) Physical Activity Primary Questions
    1. To help me better understand, can you tell me how would you describe physical activity?
    2. What are the things that prevent you from or help to motivate you to participate in physical activity?
        i. Secondary Questions
            a. What physical activities do you enjoy participating in? If none, why do you dislike various types of physical activity?
            b. What are ways that your friends and peers influence your participation in physical activities?
            c. How confident do you feel in participating in physical activities? What are some aspects about physical activity that you think your confidence influences?
            d. What programs or parts of your environment motivate or prevent you from participating in physical activity?

Follow-up questions if the participant is giving short answers or you want more information:

- What PA/exercise do you like? Why?
- Do you participate in PA/exercise with others? If so, who? When? Why?
- How do you choose PA/exercise?
- Do you feel as though anything or anyone influences your decisions?
- What benefits do you gain from PA/exercise?
- Are there things you don't like or enjoy about PA/exercise?

Appendix G

Physical Activity Scale for Individuals with Physical Disabilities

Instructions: This questionnaire is about your current level of physical activity and exercise. Please remember there are no right or wrong answers. We simply need to assess your current level of activity.

Leisure Time Activity

1. During the past 7 days how often did you engage in *stationary activities* such as reading, watching TV, computer games, or doing handcrafts?

Never (Go to question #2)

Seldom (1-2d)

Sometimes (3-4d)

Often (5-7d)

What were these activities?

On average, how many hours per day did you spend in these *stationary activities*?

Less than 1hr

1 but less than 2hr

2-4hr

More than 4hr

2. During the past 7 days, how often did you *walk, wheel, push outside* your home *other than specifically for exercise*. For example, getting to work or class, walking the dog shopping, or other errands?

Never (Go to question #3)

Seldom (1-2d)

Sometimes (3-4d)

Often (5-7d)

On average, how many hours per day did you spend wheeling or pushing outside your home?

Less than 1hr

1 but less than 2hr

2-4hr

More than 4hr

3. During the past 7 days, how often did you engage in *light sport or recreational activities* such as bowling, golf with a cart, hunting or fishing, darts, billiards or pool, therapeutic exercise (physical or occupational therapy, stretching, use of a standing frame) or other similar activities?

Never (Go to question #4)

Seldom (1-2d)

Sometimes (3-4d)

Often (5-7d)

What were these activities?

On average, how many hour per day did you spend in these *light sport or recreational* activities?

Less than 1hr

1 but less than 2hr

2-4hr

More than 4hr

4. During the past 7 days, how often did you engage in *moderate sport and recreational* activities such as doubles tennis, softball, golf without a cart, ballroom dancing, wheeling or pushing for pleasure or other similar activities?

Never (Go to question #5)

Seldom (1-2d)

Sometimes (3-4d)

Often (5-7d)

What were these activities?

On average, how many hours per day did you spend in these *moderate sport and recreational* activities?

Less than 1hr

1 but less than 2hr

2-4hr

More than 4hr

5. During the past 7 days, how often did you engage in *strenuous sport and recreational* activities such as jogging, wheelchair racing (training), off-road pushing, swimming, aerobic dance, arm cranking, cycling (hand or leg), singles tennis, rugby, basketball, walking with crutches and braces, or other similar activities

Never (Go to question #6)

Seldom (1-2d)

Sometimes (3-4d)

Often (5-7d)

What were these activities?

On average, how many hours per day did you spend in these *strenuous sport or recreational* activities?

Less than 1hr

1 but less than 2hr

2-4hr

More than 4hr

6. During the past 7 days, how often did you do any exercise *specifically to increase muscle strength and endurance* such as lifting weights, push-ups, pull-ups, dips, or wheelchair push-ups, etc.?

Never (Go to question #7)

Seldom (1-2d)

Sometimes (3-4d)

Often (5-7d)

What were these activities?

On average, how many hours per day did you spend in these *exercises to increase muscle strength and endurance*?

Less than 1hr

1 but less than 2hr

2-4hr

More than 4hr

Household Activity

7. During the past 7 days, how often have you done any *light housework*, such as dusting, sweeping floors or washing dishes?

Never (Go to question #8)

Seldom (1-2d)

Sometimes (3-4d)

Often (5-7d)

On average, how many hours per day did you spend doing *light housework*?

Less than 1hr

1 but less than 2hr

2-4hr

More than 4hr

8. During the past 7 days, how often have you done any *heavy housework or chores* such as vacuuming, scrubbing floors, washing windows, or walls, etc.?

Never (Go to question #9)

Seldom (1-2d)

Sometimes (3-4d)

Often (5-7d)

On average, how many hours per day did you spend doing *heavy housework or chores*?

Less than 1hr

1 but less than 2hr

2-4hr

More than 4hr

9. During the past 7 days, how often you done *home repairs* like carpentry, painting, furniture refinishing, electrical work, etc.?

Never (Go to question #10)

Seldom (1-2d)

Sometimes (3-4d)

Often (5-7d)

On average, how many hours per day did you spend doing *home repairs*?

Less than 1hr

1 but less than 2hr

2-4hr

More than 4hr

10. During the past 7 days how often have you done *lawn work or yard care* including mowing, leaf or snow removal, tree or bush trimming, or wood chopping, etc.?

Never (Go to question #11)

Seldom (1-2d)

Sometimes (3-4d)

Often (5-7d)

On average, how many hours per day did you spend doing *lawn work*?

Less than 1hr

1 but less than 2hr

2-4hr

More than 4hr

11. During the past 7 days, how often have you done *outdoor gardening*?

Never (Go to question #12)

Seldom (1-2d)

Sometimes (3-4d)

Often (5-7d)

On average, how many hours per day did you spend doing *outdoor gardening*?

Less than 1hr

1 but less than 2 hr

2-4hr

More than 4hr

12. During the past 7 days, how often did you *care for another person*, such as children, a dependent spouse, or another adult?

Never (Go to question #13)

Seldom (1-2d)

Sometimes (3-4d)

Often (5-7d)

On average, how many hours per day did you spend *caring for another person*?

Less than 1hr

1 but less than 2hr

2-4hr

More than 4hr

Work-Related Activity

13. During the past 7 days, how often did you *work for pay or as a volunteer*? (Exclude work that mainly involved sitting with slight arm movement such as light office work, computer work, light assembly line work, driving bus or van, etc.)

Never (Go to END)

Seldom (1-2d)

Sometimes (3-4d)

Often (5-7d)

On average, how many hours per day did you spend *working for pay or as a volunteer*?

Less than 1hr

1 but less than 4hr

5 but less than 8hr

8hr or more

Appendix H

Leisure Time Physical Activity Questionnaire for People with Spinal Cord Injury

INSTRUCTIONS: I am going to ask you about the time you spent engaging in mild, moderate, and heavy intensity LTPA in the last 7 days. Leisure Time Physical Activity (LTPA) is physical activity that you choose to do during your free time, such as exercising, playing sports, gardening, and taking the dog for a walk (necessary physical activities such as physiotherapy, grocery shopping, pushing/wheeling for transportation are not considered LTPA).

1. Mild intensity LTPA requires very light physical effort; mild intensity activities make you feel like you are working a little bit, but you can keep doing them for a long time without getting tired …

During the last 7 days, on how many days did you do mild intensity LTPA? _____

On each day, how many minutes did you usually spend doing mild intensity LTPA? _____

**Briefly describe what activities you did for mild intensity LTPA:

_____

_____

**Briefly describe where (facilities/locations) you performed mild intensity LTPA, both on your university campus and off: _____

_____

**Briefly describe any specific equipment, materials, or resources you used to perform your mild intensity LTPA: _____

_____

2. Moderate intensity LTPA requires some physical effort; moderate intensity activities make you feel like you are working somewhat hard, but you can keep doing them for a while without getting tired…

During the last 7 days, on how many days did you do moderate intensity LTPA? _____

On each day, how many minutes did you usually spend doing moderate intensity LTPA? _____

**Briefly describe what activities you did for moderate intensity LTPA:

_____

_____

**Briefly describe where (facilities/locations) you performed moderate intensity LTPA, both on your university campus and off: _____

_____

**Briefly describe any specific equipment, materials, or resources you used to perform your moderate intensity LTPA: _____

_____

3. Heavy intensity LTPA requires a lot of physical effort. Heavy intensity activities make you feel like you are working really hard, almost at your maximum. You cannot do these activities for very long without getting tired. These activities may be exhausting.

During the last 7 days, on how many days did you do heavy intensity LTPA? _____

On those days, how many minutes did you usually spend doing heavy intensity LTPA?_____

**Briefly describe what activities you did for heavy intensity LTPA:

_____

_____

**Briefly describe where (facilities/locations) you performed heavy intensity LTPA, both on your university campus and off: _____

_____

**Briefly describe any specific equipment, materials, or resources you used to perform your heavy intensity LTPA: _____

_____

4. **During the last month, how many times did you use your university's recreation center for LTPA? _____

5. **During the last completed semester (if applicable), how many times did you use your university's recreation center for LTPA? _____

**Questions not original to questionnaire - added to provide more specific and supplementary information for current study.

Appendix I
World Health Organization Quality of Life-BREF

The following questions ask how you feel about your quality of life, health, or other areas of your life. I will read out each question to you, along with the response options. **Please choose the answer that appears most appropriate.** If you are unsure about which response to give to a question, the first response you think of is often the best one.

Please keep in mind your standards, hopes, pleasures and concerns. We ask that you think about your life in **the last four weeks**.

1. Very Poor
2. Poor
3. Neither Poor nor Good
4. Good
5. Very Good

1. How would you rate your quality of life? 1 2 3 4 5

1. Very Dissatisfied
2. Dissatisfied
3. Neither Satisfied nor Dissatisfied
4. Satisfied
5. Very Satisfied

2. How satisfied are you with your health? 1 2 3 4 5

The following questions ask about how much you have experienced certain things in the last four weeks.

1. Not at all
2. A Little
3. A Moderate Amount
4. Very Much
5. An Extreme Amount

3. To what extent do you feel that physical pain prevents you from doing what you need to do?

5 4 3 2 1

4. How much do you need any medical treatment to function in your daily life?

5 4 3 2 1

5. How much do you enjoy life? 1 2 3 4 5

6. To what extent do you feel your life to be meaningful? 1 2 3 4 5

1. Not at all
2. A Little
3. A Moderate Amount
4. Very Much
5. Extremely

7. How well are you able to concentrate? 1 2 3 4 5

8. How safe do you feel in your daily life? 1 2 3 4 5

9. How healthy is your physical environment? 1 2 3 4 5

The following questions ask about how completely you experience or were able to do certain things in the last four weeks.

1. Not at All
2. A Little
3. Moderately
4. Mostly
5. Completely

10. Do you have enough energy for everyday life? 1 2 3 4 5

11. Are you able to accept your bodily appearance? 1 2 3 4 5

12. Have you enough money to meet your needs? 1 2 3 4 5

13. How available to you is the information that you need in your day-to-day life?

1 2 3 4 5

14. To what extent do you have the opportunity for leisure activities?

1 2 3 4 5

1. Very Poor
2. Poor
3. Neither Poor nor Good
4. Good
5. Very Good

15. How well are you able to get around? 1 2 3 4 5
    1. Very Dissatisfied
    2. Dissatisfied
    3. Neither Satisfied nor Dissatisfied
    4. Satisfied
    5. Very Satisfied

16. How satisfied are you with your sleep? 1 2 3 4 5

17. How satisfied are you with your ability to perform your daily living activities?

    1 2 3 4 5

18. How satisfied are you with your capacity for work? 1 2 3 4 5

19. How satisfied are you with yourself? 1 2 3 4 5

20. How satisfied are you with your personal relationships? 1 2 3 4 5

21. How satisfied are you with your sex life? 1 2 3 4 5

22. How satisfied are you with the support you get from your friends?
    1 2 3 4 5

23. How satisfied are you with the conditions of your living place?

    1 2 3 4 5

24. How satisfied are you with your access to health services?

    1 2 3 4 5

25. How satisfied are you with your transport? 1 2 3 4 5

The following question refers to how often you have felt or experienced certain things in the last four weeks.

1. Never
2. Seldom
3. Quite often
4. Very often
5. Always

26. How often do you have negative feelings such as blue mood, despair, anxiety, depression?

    5 4 3 2 1

Appendix J

SCI Exercise Self-Efficacy Scale

Please tell us how confident you are with regard to carrying out regular physical activities.

I am confident…

1. …that I could always overcome barriers and challenges with regard to exercise if I try hard enough.

(1) Not at all true (2) Hardly True (3) Moderately True (4) Exactly True

2. …that I could find the means and ways to exercise and be physically active.

(1) Not at all true (2) Hardly True (3) Moderately True (4) Exactly True

3. …that it is easy for me to accomplish my activity and exercise goals.

(1) Not at all true (2) Hardly True (3) Moderately True (4) Exactly True

4. …that when I am confronted with a barrier to exercise I could usually find several solutions to overcome this barrier.

(1) Not at all true (2) Hardly True (3) Moderately True (4) Exactly True

5. …I could exercise even when I am tired.

(1) Not at all true (2) Hardly True (3) Moderately True (4) Exactly True

6. I could exercise even when I am feeling depressed.

(1) Not at all true (2) Hardly True (3) Moderately True (4) Exactly True

7. …that I could exercise even without the support of my family or friends.

(1) Not at all true (2) Hardly True (3) Moderately True (4) Exactly True

8. …that I could exercise without the help of an exercise therapist.

(1) Not at all true (2) Hardly True (3) Moderately True (4) Exactly True

9. …that I could be physically active despite my spinal cord injury

(1) Not at all true (2) Hardly True (3) Moderately True (4) Exactly True

10.…that I could exercise even if I had no access to a gym or training facility.

(1) Not at all true (2) Hardly True (3) Moderately True (4) Exactly True

Appendix K

Self-Regulation/Intention Questions

Please rate you're the level to which you feel the following statement is true or false:

1) I will try to do at least 30 min of moderate to heavy physical activity 3 days per week over the next 4 weeks

(Definitely false) 1 2 3 4 5 6 7 (Definitely true)

Please rate how likely it is that you will complete the following statement:

2) I intend to do at least 30 min of moderate to heavy physical activity 3 days per week in the forthcoming month.

(Extremely unlikely) 1 2 3 4 5 6 7 (Extremely likely)

Appendix L

SCOPE: Social and Community Opportunities Profile

Leisure Time

1. Do you feel there are leisure, sports, or fitness facilities accessible to you on campus?

   Y/N

2. Do you currently use any leisure, sports, or fitness facilities on your campus?

   Y/N

3. How do you feel about the opportunities that you have on your campus to participate in leisure activities?

   (1) Terrible
   (2) Displeased
   (3) Mostly Dissatisfied
   (4) Mixed
   (5) Mostly Satisfied
   (6) Pleased
   (7) Delighted

4. What barriers to physical activity (if any) do you feel exist your campus environment, or what do you feel decreases your likelihood to be physically active on campus (i.e. physical environment, building accessibility, lack of recreational opportunities, etc.)? **

_____

5. What facilitators to physical activity (if any) do you feel exist your campus environment, or what do you feel increases your likelihood to be physically active on campus? **

_____

6. What do you think about the general availability of campus groups, clubs, and organizations on campus for you?

   (1) Plenty of opportunities
   (2) There are some good opportunities
   (3) Mixed
   (4) Opportunities are quite limited
   (5) Opportunities are extremely restricted

8. How do you feel about the range of opportunities to be involve with your campus community groups, clubs, or organizations that are available to you?

   (1) Terrible
   (2) Displeased
   (3) Mostly Dissatisfied
   (4) Mixed
   (5) Mostly Satisfied
   (6) Pleased
   (7) Delighted

Peers and Friends

9. How many people would you call a friend on your campus? _____

10. How often do you visit, spend times with, or hang out with friends or neighbors?

(1) Every day
(2) Several times a week
(3) At least once a week
(4) At least once every other week
(5) At least once a month
(6) Less than once a month
(7) Never

11. How do you feel about your opportunities on campus to make new friends or meet new people?

(1) Terrible
(2) Displeased
(3) Mostly Dissatisfied
(4) Mixed
(5) Mostly Satisfied
(6) Pleased
(7) Delighted

12. Overall, how do you feel about the extent that you are included in your campus community?

(1) Terrible
(2) Displeased
(3) Mostly Dissatisfied
(4) Mixed
(5) Mostly Satisfied
(6) Pleased
(7) Delighted

13. What are ways you think your university could improve your physical activity behavior/sports participation on your campus? **

_____

**Questions not original to questionnaire - added to provide more specific and supplementary information for current study.

Appendix M

Barriers to Physical Exercise and Disabilities Survey

1. Would you like to begin an exercise program?

Already in an exercise program Yes No

2. Have you ever exercised? Yes No

2a. IF "Yes" Did you ever have any health problems that caused you to stop exercising?

Yes No

3. Have you ever been injured from exercising? Yes No

4. I have gone to a fitness center, but it was not a positive experience. Yes No

4a. IF “YES” Why? _____

_____

_____

5. Have you ever exercised regularly? Yes No

6. Do you know of a fitness center that you could get to? Yes No

7. Would you be willing to spend this money? Yes No

8. Would you have any concerns about exercising in a facility like your campus recreation center?

8a. IF "Yes”, what are your concerns? _____

_____

_____

9. Do you feel that an exercise instructor in a fitness center like your campus recreation center would know how to set up an exercise program to meet your needs? Yes No

10. Do you feel that an exercise program could help you? Yes No

11. Are you ever afraid to leave your home? Yes No

12. Has your doctor ever told you to exercise? Yes No

12a. IF "Yes" Did your doctor tell you to do anything specific? Yes No

12b. IF "No" Has your doctor told you not to exercise? Yes No

13. I am satisfied with my physical appearance, so I do not need to exercise Yes No

14. Family responsibilities prevent me from exercising as much as I would like Yes No

15. My job prevents me from exercising as much as I would like Yes No

16. Are any of the following statements, concerns why you might not be involved in an exercise program or not exercising as much as you would like?

Cost of the exercise program	Yes	No
Lack of transportation	Yes	No
Lack of time	Yes	No
Lack of interest	Yes	No
Lack of energy	Yes	No
Lack of motivation	Yes	No
Lack of support from friends or family to exercise	Yes	No
Lack of a personal care attendant who will help me exercise	Yes	No
Lack of accessible facility	Yes	No
Exercise is boring or monotonous	Yes	No
Exercise will not improve my condition	Yes	No
Exercise will make my condition worse	Yes	No
Exercising is too difficult	Yes	No
Don't know how to exercise	Yes	No
Don't know where to exercise	Yes	No
Health concerns prevent me from exercising	Yes	No
Pain prevents me from exercising	Yes	No
I am too old to exercise	Yes	No
Feel uncomfortable or self-conscious in a fitness center	Yes	No

17. Can you think of any other reasons why you might not be involved in an exercise program or not exercising as much as you would like? If so, please list:

_____

_____

Thank you for completing this survey!

Appendix N

Post-Intervention Interview Questions (Chapter 4)

Questions based off of interview questions used in Blinde and McClung's study [115].

1. Please describe your overall experiences in the aquatic exercise program.
2. Please describe how you feel about your experiences in the aquatic exercise program.
3. What do you believe are the positive outcomes of your experiences in the aquatic exercise program?
4. Did your participation in the aquatic exercise program change your perceptions about your physical abilities?
5. How did you feel about your body and physical abilities during the aquatic exercise program?
6. Please describe your interactions with the other participants and students during the aquatic exercise program.
7. Do you feel participation in the aquatic exercise program had an effect on your social life?
8. Do you feel as though you gained any other benefits from participating in the aquatic exercise program? If so, please describe what and why.
9. Would you participate in a program like this again?
10. Please describe any recommendations you have for future leisure time physical activity programs.